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ABSTRACT

This unit is designed to provide high school students with an introduction to topics of energy and economics. A basic premise of the unit is that energy issues and economics are interrelated. It is believed that the application of basic economic concepts to energy issues can provide students with the tools to improve their analysis of problems and will help them understand the consequences of alternative solutions to energy problems for consumers, business, or the public. The unit is comprised of 20 activities and is intended for use by teachers of social studies, science, economics, or consumer education. Among the activities included are the following: "Energy--A Scarce Resource"; "Measurement of Energy Consumption"; "Profits and Incentives in Energy Markets"; "OPEC: A Cartel Case Study"; and "Energy and the Environment." Each activity contains a program goal, objectives, key vocabulary, a list of materials, rationale, and implementation and evaluation guidelines. A supplementary materials guide is included. (DB)

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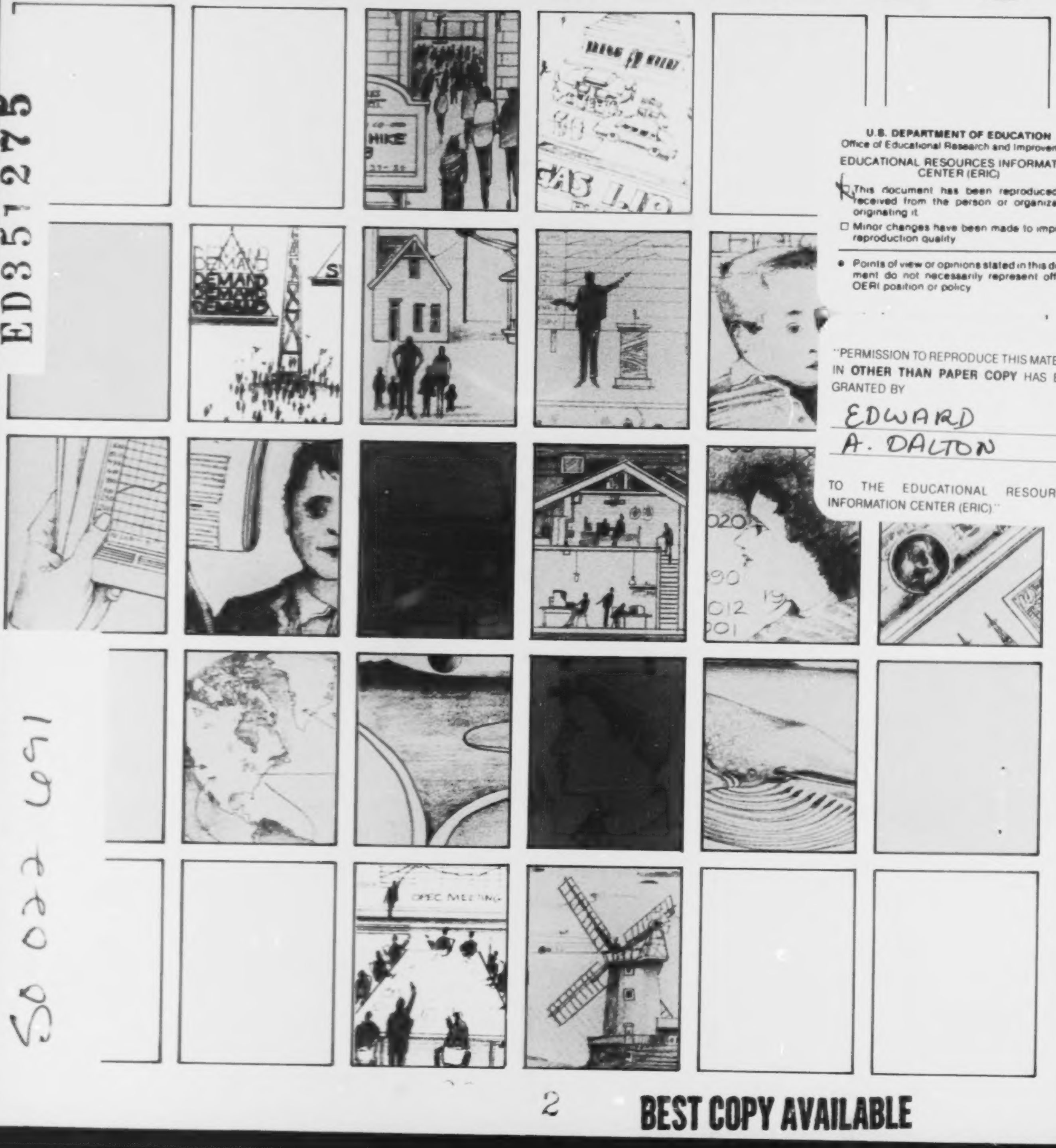
ENERGY AND ECONOMICS



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ENERGY AND ECONOMICS

by

William Walstad

and

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FOREWARD

"Energy and Economics" is a new and completely revised edition of the 1983 publication of the same name. The previous edition was a compilation of materials from many sources which was originally published by the Nebraska Energy Office. Since then, many things have changed in the area of energy economics. New sources of petroleum have been discovered and developed. More efficient uses of petroleum products have been introduced and accepted and alternative methods of power generation and heating have become widespread. The power of OPEC has been diminished yet remains an economic and political factor affecting our energy supply, national security, and economic stability.

This edition of Energy and Economics contains extensive updates of previous materials plus entirely new chapters. We hope all those who study and use the guide will find that it compliments and enhances their program of instruction. It was created to supplement and extend a variety of classroom situations. We encourage flexibility and adaptability in its use.

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TABLE OF CONTENTS

Energy and Economics: Unit Goals and Objectives 1

Energy and Economics: Overview and Rationale 2

Lesson Activities:

Activity 1: Energy--A Scarce Resource 11
Activity 2: A Framework for Energy Decision-Making 21
Activity 3: Trade-offs in Energy Choices 29
Activity 4: Opportunity Cost and Energy 35
Activity 5: Sources and Types of Energy 41
Activity 6: Measurement of Energy Consumption 51
Activity 7: Resources for Energy Production 65
Activity 8: Energy and the Laws of Demand and Supply 81
Activity 9: Competitive Markets and Cartel Power 97
Activity 10: Supplying Energy Resources 105
Activity 11: Profits and Incentives in Energy Markets 109
Activity 12: Profits in the Oil Industry 115
Activity 13: OPEC: A Cartel Case Study 125
Activity 14: World Energy Markets 131
Activity 15: Inflation and Energy Prices 139
Activity 16: Energy Prices and Economic Justice 147
Activity 17: Energy Futures 153
Activity 18: Energy and Taxes 161
Activity 19: Public Utility Rates and Regulation 175
Activity 20: Energy and the Environment 181

Supplementary Materials Guide 189

ENERGY AND ECONOMICS

Unit Goals and Objectives

Recommended Level

Grades 9-12

Academic Areas:

Social Studies, Economics, Science, Consumer Education

Time Required:

Each lesson activity can be completed within one class period (30 - 60 minutes).

Process Skills:

analyzing
interpreting data
researching
writing
reading
note taking
graphing
role playing
measuring
record keeping
discussing

Goals:

When students complete this guide, they should be able to make the following generalizations

1. Energy issues often include an economic dimension.

2. Basic economic concepts, such as scarcity, opportunity cost, market supply and demand, can be applied to energy issues since energy is a scarce resource.

3. An energy-related problem often requires economic analysis before a decision can be made about how to solve the problem.

Energy and Economics

Overview and Rationale

The events of the past decades raised new interest in energy education and created greater recognition of the important role energy plays in our economy. In the 1970's, the price of a barrel of oil increased over six-fold, and at times shortages of oil, gasoline, and natural gas threatened the livelihood of both consumers and producers. The crisis situation also prompted new exploration for basic energy resources and stimulated new investment in research and development of alternative energy sources. Increasing environmental concerns added to the difficulties by slowing the growth of nuclear power production and by introducing stricter pollution standards in use of gasoline and coal. In an earlier decade the United States government declared war on poverty; the target of the past decade was imported energy.

Although energy markets have stabilized in recent years and the economy appears to have adjusted to previous energy shocks, the need for energy education remains strong. From a business viewpoint, energy is a basic resource input in the production of most goods and services-from fertilizers, to plastics, to transportation. The price of energy has and will continue to have a profound impact on such basic economic questions as: What goods and services will be produced? How will the products be produced? And, who will get (or be able to afford) the output produced? From the consumer viewpoint, the price and availability of energy will strongly influence housing, lifestyle, and career decisions. We, as citizens, are often asked to discuss and vote on energy-related matters, ranging from a gasoline tax for roads to energy tax credits for low-income consumers.

Consequently, this curriculum unit on energy and economics is designed to provide high school students with an introduction to topics of energy and economics. Energy issues and economics are interrelated. Failure to explore the economic dimension to energy problems means that student understanding will remain incomplete and the depth of the analysis will be limited. The application of basic economic concepts to energy issues can provide students with the tools to improve their analysis of the problems and will help them understand the consequences of alternative solutions to energy problems for consumers, business, or the public.

This curriculum unit offers high school teachers of social studies, science, economics, or consumer education a package of 20 lessons on basic economic concepts and their application to energy issues. The unit is flexible and can be used in whole or in part to fit specific classroom needs. The lesson material should be self-explanatory for both teachers and students and it does not require that either have a background in economics. A basic description of each lesson is provided in the following paragraphs and it should be read before using the lesson.

Activity 1: Energy - A Scarce Resource

Activity 1 begins by developing the understanding that energy is a scarce resource. Scarcity in economics means that productive resources, such as energy, are limited relative to our wants (uses) for them. Since energy resources are scarce goods they have economic value. Their value is reflected in our market system by prices. A rising price, as occurred with whale oil from the mid 1700's to the mid 1800's, indicates that this economic good was becoming relatively more scarce; conversely, a falling price for an energy resource, as occurred with whale oil after the mid 1800's, means that whale oil became relatively less scarce from the economist's perspective.

Persistent shortages (often referred to as crises) are generally an indication that economic goods, such as whale oil, wood, or petroleum, have become relatively more scarce. Government intervention in the market system, through price controls or other restrictions, prevents prices from rising high enough to balance quantities supplied with quantities demanded. When price no longer determines who gets to use the scarce resource, then some other mechanism comes into play. During the 1970's, government price controls were imposed on gasoline. Then came the gasoline shortages of 1974 and 1979, and government allocation plans were considered along with the old custom of first-come first-served to determine who would get gasoline. Long lines formed at the gas pumps until supplies were exhausted at the controlled price. What needs to be remembered by teachers, however, is that even where there are no energy shortages, and supply needs are balanced with demand needs, energy is still scarce if it has economic value. Sunlight, wind and tidal energy may be the few present exceptions to this rule.

Activity 2: A Framework for Energy Decision-Making

The condition of scarcity necessitates choice, and consequently, calls for consumers, producers, or workers to make difficult economic decisions. Decisions can be made in a multitude of ways. We can make a decision by flipping a coin (chance). We can ask our friends or close relatives what they think. We can let an expert or authority figure decide for us.

No matter how the decision is finally made, it is usually worthwhile with most important decisions to give careful consideration to the problem. Activity 2 presents a basic framework for making economic decisions based on a five-step problem-solving model. The framework is easy to use and helps students see all the important dimensions of a decision and the opportunity costs of an energy choice. The examples and framework also show students that there is a more rational way to make decisions than by chance, peer pressure, edict, wish, or fancy.

Activity 3: Trade-offs in Energy Choices

As was explained in Activity 1, an overriding characteristic of productive resources is that they are limited relative to our wants or uses for them. This basic economic problem of scarcity forces people to make choices. Whenever individuals choose to consume or produce one economic resource instead of another economic resource, they are making a trade-off--that is, they are trading off less of one thing for more of something else.

Society makes trade-offs, too. There is, for instance, a trade-off between energy production or consumption and environmental quality. As we choose to produce more energy we may be reducing the quality of the environment because of the increased pollution from the increased energy production. This fundamental dilemma is illustrated in the role-playing situation in Activity 3.

The value of what we receive in making a trade-off is the estimate of the benefit from the choice. The value of what we give up in making the trade-off is our measure of opportunity cost. In some cases, opportunity cost is measured in dollars spent. For example, the opportunity cost of $100 million dollars in government spending on energy research is the loss of the opportunity to spend those funds on other federal programs. In other cases, opportunity costs can not be measured strictly in money terms. For example, an increase in energy production may have an opportunity cost in terms of reduced environmental quality, but clean air has no exact price tag. Both monetary and non-monetary costs and benefits of alternative choices are essential to consider as part of the trade-off dilemma in decision-making.

Activity 4: Opportunity Cost and Energy

Since scarcity is a universal condition for all productive resources, people are forced to choose how best to use their limited resources. Any time we choose or make an economic decision, there is an opportunity cost because a decision-maker gives up the opportunity to use those scarce resources in some other way. For example, the opportunity cost of imposing a maximum 55-mile-per-hour speed limit on drivers across the country was the increased time drivers had to spend on the road going from one location to another. Of course there were benefits from this action in the form of saved lives and reduced gasoline consumption, but the fact remains that with any economic decision there is an opportunity cost. Activity 4 presents this basic concept and allows students to identify the opportunity costs in a transportation problem.

Activity 5: Sources of Energy

Whenever there is a decision to be made, a person or society needs to know what alternatives are available from which to choose. Energy is a broad topic and students need to identify the major energy resources and to learn about the feasibility of their expanded use. Activity 5 presents students with basic information on energy sources. Students are then asked to do library research on a selected energy source and write a short report evaluating relative cost and potential benefits of developing this fuel source.

Also in this activity, three worksheets are provided to teach students how to read, interpret and construct circle graphs, bar graphs and line graphs.

Activity 6: Measurement of Energy Consumption

Energy resources are commodities which are bought and sold in markets. Knowledge of the essential relationship between energy and economics requires that students develop a basic understanding of demand and supply factors in energy markets. Activities 6 through 10 build the essential skills necessary for students to apply the concepts of supply and demand to energy decisions.

Activity 6 focuses on energy measurement and consumption. Consumers are often not aware of the quanitity of energy consumed, so the exercises show students how to measure electricity consumption in the home. Then, the relationship between electricty consumption and price is explored. Students are asked to hypothesize about what would happen to electrical consumption if the price significantly increases or decreases. The purpose of the lesson is to develop an intuitive notion of the "law of demand." Simply stated, there is an observed inverse or negative relationship between price and quantity consumed, so as electricity prices increase significantly, consumers will reduce their consumption, and vice versa.

Activity 7: Resources for Energy Production

To meet our energy consumption wants, a supply of energy goods (e.g., electricity, gasoline, heating oil) must be provided for purchase in the market. The production of energy in turn depends on supplies of productive resources.

There are three basic types of productive resources. Natural resources (also called land) are gifts of nature. Water, wind, the sun and forests are examples of renewable natural resources. Nonrenewable natural resources such as oil, coal and natural gas are used up in the energy production process. Human resources (also referred to as labor) are the skills and abilities of people in our society to produce goods or services. Finally, there are capital resources (capital goods) which are physical goods which can be used to produce other goods or services. Examples of capital goods include machines, tools or factories. The three basic resources are defined in the first part of the activity.

Most energy production requires the use of natural, human and capital resources. This idea is illustrated in the second part of the activity using electrical production as the example.

Activity 8: Energy and the Laws of Demand and Supply

The determination of energy prices and quantity exchanged in a market involve both demand and supply. Activity 8 formally presents the "law of demand" and the "law of supply" using a simple graphical example for teachers to use with students. Follow-up worksheets ask students to apply the basic ideas to answer questions about the supply and demand.

Activity 9: Competitive Markets and Cartel Power

Activity 9 is a simulation on how prices are determined in a market for oil. Part I of the simulation provides an excellent example of competitive markets and price determination in action. In Part II of the simulation, a cartel is created by the oil producing nations (sellers) and these nations set the price for barrels of oil. In the debriefing session students are asked to discuss the impact of cartel formation and price setting on the competitive market. Part III demonstrates the effects of an increase in oil supplies on price.

Activity 10: Supplying Energy Resources

Supply factors must also be considered when examining the energy market. Activity 10 uses a simulation activity (the geologist's dilemma) to illustrate how additional energy supplies are discovered and brought to market. In the simulation students are asked to gather beads and cornmeal scattered throughout the classroom. The beads represent energy resources (e.g., coal, oil, natural gas, solar). At first, student teams find it easy to collect the resources, but over time additional exploration produces less energy and the cost of recovery rises. The simulation provides a "hands-on" demonstration that as energy resources become more difficult to extract and search costs rise, the price (or incentive paid to producers) must rise. Thus, the simulation provides an intuitive explanation for the observed positive relationship between price and the quantity supplied. The relationship is known as the "law of supply." As price rises, the quantity supplied by producers increases; as price falls, the quantity supplied by producers decreases.

Activity 11: Profits and Incentives in Energy Markets

Profits are the driving force of a market economy. In fact, it is the expectation of profit that motivates businesses to obtain the necessary natural, human, and capital resources to produce energy. For example, oil companies purchase land, construct drilling towers, and hire skilled workers in their never-ending search for oil. As profits increase, the oil companies have an even greater economic incentive to expand their search for oil by drilling more wells.

Activity 11 presents activities which help students understand the role of profits in the market economy. The first worksheet helps illustrate the idea that profit is the difference between total revenue (price of the product times the quantity sold) and the total costs of productive resources. The second worksheet presents data on oil prices and drilling activity to illustrate effects of expected profits on production and supply.

Activity 12: Profits in the Oil Industry

One of the least understood concepts in economics is profits. Profits provide the incentives for producers to accept the risk and uncertainty involved in bringing a product to market. In some years, oil companies have made large profits and the subject has attracted substantial media attention. Activity 12 examines the profits in the petroleum industry and presents several accounting definitions of profit. The key point of the activity is that profits should not be discussed solely in absolute terms (i.e., oil company X earned $4 billion dollars) for that fact is insignificant. To evaluate profits, a person needs a relative measure, such as net profits as a percent of return on stockholder's equity, or net profits as a percent of return on sales. When viewed in relative terms, profit reports take on more meaning and comparisons can be made across companies and industries. Activity 12 lets students examine profit rates and changes in the petroleum industry over the 1980 to 1982 period.

Activity 13: OPEC: Cartel Case Study

Activity 13 is a follow-up activity to the simulation of activities 9 and 10. In this activity students are given an outline of the OPEC cartel history. Students are asked to complete a worksheet tracing the major events in the past 23 years of the OPEC cartel. Recently, the power of the OPEC cartel has diminished due to new sources of oil and decling demand in the oil market.

Activity 14: World Energy Markets

Activity 14 uses maps and data to illustrate the relationship between petroleum energy suppliers and consumers in a world economy. In the United States the oil demand is greater than supply so we must import oil from energy-rich nations where energy demands are less than energy supplies (e.g., OPEC countries). The basic purpose of the activity is to illustrate for students how interdependent our economic world has become. Imbalance in energy resources forces nations to trade to meet their energy wants or to benefit from natural abundance. Trading among nations for such basic commodities as energy resources makes nations more dependent on each other, but gives countries more production or consumption opportunities.

Activity 15: Inflation and Energy Prices

Prices for goods and services are often changing. This fact has been especially apparent in energy markets in the past decade. The purpose of this activity is to show how we measure price changes in our economy so we can determine if we are experiencing a period of inflation, deflation or price stability over time.

When the average level of all prices in our economy is rising, this trend is called price inflation. When the average of all prices is falling, we are experiencing deflation. If the average of all prices stays about the same, we are experiencing a period of price stability. The measurement of these trends is important because price levels affect how many goods and services people can afford to buy. If prices rise faster than incomes, then we conclude that purchasing power or real income has fallen. If, for example, gasoline prices are rising faster than the prices of other goods and services and incomes, then purchasing power would fall and people would probably be forced to spend less on gasoline.

One way to compare price changes is through the use of a price index. This activity explains how the Consumer Price Index (CPI) is constructed. Then, a similar energy price index (EPI) is constructed and the CPI and EPI are compared from 1967 to 1982.

Activity 16: Energy Prices and Economic Justice: Problems with High Cost Energy

Fairness or economic justice is an important economic goal in our society. Low-income people are affected more by high energy costs than the rest of the population because as the price of energy rises, home energy costs begin to take up a larger percentage of low-income consumer budgets than high-income consumer budgets. Often, government solutions are sought as a way to alleviate this problem for the poor and to provide economic justice (fairness) in the energy market place. Activity 16 highlights the problem and suggests alternative solutions for student analysis.

Activity 17: Energy Futures

Although oil imports from the Middle East are below the 1977 peak, existing known reserves of oil are still predominantly found in the Middle East. If new discoveries in the U.S. or other countries are not made, then the U.S. could again become excessively dependent on Middle East oil, and oil prices would probably rise. The new price incentive would encourage a search for alternative energy sources--a topic explored in this activity.

Activity 17 looks at past trends and future prospects. In the first worksheet, students are given graph data on the relative sources of energy in different time periods of our history from 1850 to 1980. The second worksheet asks students to research information on alternative energy sources which may become economically viable sources of energy in the future. Finally the student is asked to consider the policy implications of government intervention to promote alternative energy production.

Activity 18: Energy and Taxes

Over the years we have taxed energy production and consumption. These taxes are then borne by either the producer, the consumer, or both groups. Tax incidence involves determining who bears the burden of a tax. When a tax is imposed, the burden can often be shifted from the intended group (producers) to the unintended group (consumers). This shift occurs because their reactions to the tax cause changes in prices and output.

This activity provides examples of how the tax burden can be shifted when a state excise or sales tax is imposed on a specific good. The activity first demonstrates the concept of tax incidence with a sales tax on cigarettes. Students then apply their understanding to an excise tax on gasoline.

Activity 19: Public Utility Rates and Regulation

Energy production and distribution is often regulated. For example, most states have public utility commissions which regulate electric power and natural gas suppliers. This activity focuses on the underlying economic concept for utility regulation - the role of natural monopolies in our economic system. The activity explains why utilities are often regulated and identifies key issues in a utility rate case. Both worksheet and role-playing exercises are used to convey the activity objectives to students.

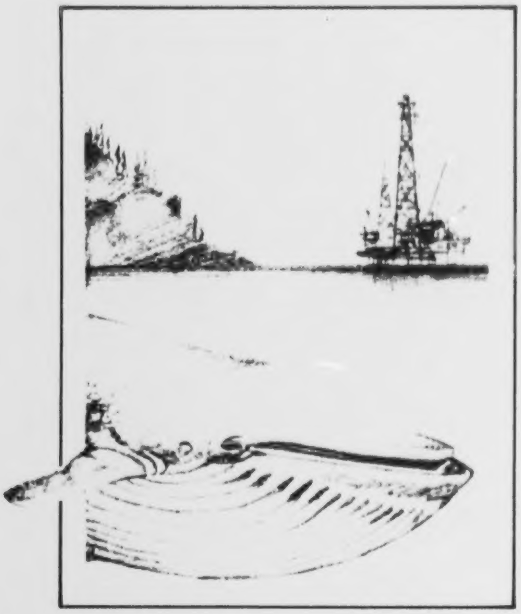
Activity 20: Energy and the Environment

Energy production and use can cause spillover costs to society. Air pollution from electricity production or gasoline consumption would be examples. Other examples would be nuclear wastes from nuclear power plants or strip-mining of land for coal production. These negative externalities or spillover costs are explored in the activity. Students are given a reading and worksheet each addressing these externality problems and the methods we have used to reduce external costs - regulation, taxation, and subsidization.

Students should learn from the activity that energy production and use means that there will be trade-offs between energy use and environmental protection. In each case, we have to decide as a society whether the opportunity cost of potential or actual damage to the environment is worth the benefits we receive from energy resource use. This dilemma is a tough one for students and our society to resolve. It is a fitting end for the unit because it illustrates controversies over energy that will be with us in the future.

Activity 1

ENERGY-
A SCARCE RESOURCE



PROGRAM GOAL:

The learner should understand that the amount of energy resources and their availability for human activity vary.

OBJECTIVES:

Students will define scarcity and be able to give examples of it.
Students will identify causes of past energy crises.

KEY VOCABULARY:

scarcity, energy crisis

MATERIALS:

Worksheets:	1A. Whale Shortage
	1B. Wood Shortage
	1C. Petroleum Shortage in the 1970's

RATIONALE:

Changes in lifestyle and population growth have led to an increasing demand for energy in the face of limited energy resources. This activity will help students see that energy resources are limited relative to wants. Energy, therefore, is a scarce resource. When an energy resource becomes relatively more scarce, the situation may produce an energy crisis, but at the same time it may prompt the development of alternative fuels. History provides many examples of this process.

IMPLEMENTATION:

Give each student the worksheets/readings: "Whale Shortage," "Wood Shortage" and "Petroleum Shortage in the 1970's." Discuss the readings with students using these questions as a guide.

1. Why was whale oil preferred to other lamp fuels during most of the 1800's? (It burned brighter.)

2. What happened to the price of whale oil? (It increased from 43 cents a gallon to $2.55 over 100 years.)

3. Why did the price change? (As more and more whales were slaughtered, it became more costly to find whales. Whale oil became more scarce relative to the amount people wanted to use.)

4. What caused people to use less whale oil? (Higher prices, calls to public to conserve oil, and eventually discovery of substitutes like paraffin and kerosene.)

5. Why did consumers look for whale oil substitutes? (There was a whale oil "supply crisis;" that is, whales were becoming so scarce that some people might not be able to get whale oil at prices they could afford.)

6. Why did producers develop whale oil substitutes? (They hoped to make a profit.)

7. Why is there a wood shortage in underdeveloped countries but not in the United States? (Fewer alternative fuels are available in those countries.)

8. What similarities can you find among whale oil, wood, and petroleum shortages? (Shortages develop when a resource becomes relatively more scarce, and price does not rise enough to balance quantity supplied with quantity demanded.)

9. Has the United States experienced any fuel shortages similar to these? (During the 1970's, OPEC (Organization of Petroleum Exporting Countries) cut off its exports of oil for a time, creating a shortage at the going price. Then it raised the price of oil from less than $2.00 per barrel to over $30 per barrel in ten years. In later lessons we will see that the industrialized countries have conserved fuel and developed alternative fuels and new oil supply sources.)

EVALUATION:

After reading the articles and discussing the above questions, have the students brainstorm until they come up with an acceptable definition of scarcity. (One definition follows: scarcity means that people do not have as much of something as they want or that our resources are limited relative to our wants (uses) for them.)

Scarcity is a universal economic problem faced by all individuals and societies. Individuals, even wealthy individuals, face the problem of scarcity because they have, for example, 24 hours a day to use and must allocate scarce time resources among alternative uses. Societies, even wealthy societies, face the problem of scarcity because they do not have enough resources to satisfy all the wants or uses for them and must allocate those scarce resources carefully.

A market system helps a society allocate scarce resources such as energy by attaching a price for the use of the resource. When the resource becomes relatively more scarce, the price rises and when the resource becomes relatively less scarce, the price falls. For the economist, scarcity is a relative concept.

Shortages or energy crises may develop in those markets where a resource becomes relatively more scarce, but the price can not rise high enough for the quantity supplied to equal the quantity demanded. Shortages are evident when the demand at a given price is greater than the supply. Some examples of this are shown when lines develop to buy a limited supply of something, or when rationing is needed so everyone will get some necessary share of a product. Even where there are no shortages of a resource, scarcity still exists because we pay a price for the resource. If we did not have to pay a price for a resource, it would not have economic value and would not be considered scarce, it would be considered abundant and therefore free.

Name:______________________ Date:______________________

WORKSHEET 1A

ENERGY CRISIS - WHALE SHORTAGE!

In the mid-1770's, people discovered that whale oil could be used in lamps, and a new industry was born. Whaling off the coasts of the United States alone had 178 ships at sea producing more than one million gallons of whale oil a year. Whale oil quickly replaced other animal fats because it burned brighter.

Over the next hundred years the price of whale oil increased from 43 cents a gallon to $2.55. The slaughter of so many whales had made them more scarce. Whalers had to go farther and farther out to sea and stay out longer to produce the same amount of oil. This made their expenses higher. They had to charge more for the oil to continue making a profit. Calls went out for the public to reduce the amount of oil used and to conserve oil by using fewer lights.

Many people began to search for alternative fuels that would be as good but cost less. There seemed no doubt that a reward-a chance to earn a profit-awaited anyone who could develop a suitable substitute for scarce, expensive whale oil. That is exactly what happened.

In England, James Young discovered that paraffin could be made from oil, coal, or shale. Paraffin makes such fine candles that it is still the most widely used ingredient. The discovery of paraffin meant whale oil was no longer needed for candles, but what about oil lamps?

Coal, which was used in gaslight systems, was one answer. Kerosene made from petroleum was another. In 1859, a way was found to produce crude petroleum economically. Inventors studied petroleum to see if the thick, smoky oil could be made into a clean-burning fuel. They soon found a way to produce kerosene. Kerosene burned brighter than whale oil at about half the price. It quickly replaced whale oil in lanterns. Jobs disappeared in the whaling industry, but others were created in the kerosene business.

Adapted from: Ronald A. Banaszak, "Energy and Economics," SOCIAL EDUCATION/(April 1980, Vol. 44, No. 4), pp. 284-285

Name:____________________ Date:____________________

WORKSHEET 1B

WOOD SHORTAGE

Today there is a world-wide shortage of wood useful as a fuel. The shortage affects underdeveloped countries the most, because they have few alternatives. In many of them, rural citizens are spending more and more of their time searching for wood to heat their homes and cook their food. Often, their food must be eaten cold in dark, cold houses. These people are in a serious energy crisis because few alternatives are available. Their countries have not industrialized enough to make alternative fuels such as electricity or natural gas available.

Though industrialized countries now have alternatives to using wood as a fuel, for centuries they used it as a major source of heat and light. Wood was sometimes burned to make charcoal, which heated forges used by blacksmiths to turn iron into weapons, plows, hammers, and other tools. Even the first steamboats and railroad locomotives were wood burners.

In time the demand for wood began to deplete the supply. Forests near cities and throughout the countryside soon were stripped bare. Destruction of trees caused floods that washed away the land or turned some areas into deserts.

Progress slowed and hardships occurred wherever people and industries began to run short of wood. As wood became scarce, the rush was on to develop entirely new sources of fuel. First, ways were found to use coal and, later on, oil and natural gas. These fuels had lain below the surface of the earth for millions of years. No one had known how to make use of them, but the wood shortage forced people to look for alternative fuels.

Adapted from: Ronald A. Banaszak, "Energy and Economics," SOCIAL EDUCATION/(April 1980, Vol. 44, No. 4), pp. 284-285

Name: ______________________________ Date: ______________________________

WORKSHEET 1C

PETROLEUM SHORTAGE IN THE 1970's

During the 1960's, U.S. demand for oil grew at a slow pace. Prices were low and stayed low. However, while the price of oil remained low and the supply produced remained plentiful, demand began to increase at a faster rate.

By the early 1970's, the quantity of oil demanded in the U.S. had increased dramatically. This occurred because, over time, cheap oil was used as an energy source in place of coal and other fuels. Also, Americans bought more large, gas-guzzling cars without concern about fuel efficiency or conservation since gasoline was so plentiful and inexpensive.

Also in the early 1970's, OPEC (Organization of Oil Exporting Countries), major suppliers of the world's oil, suddenly began to restrict the available supply and raise the price of their oil for political and economic reasons. This decline in the quantity supplied occurred with a simultaneous rise in demand, and resulted in even further tremendous price increases. For a few years the U.S. demand for OPEC oil continued to rise, peaking at over 6000 million barrels per year in 1977.

Also during these years, the U.S. government regulated prices, preventing them from rising in the U.S. as high as the free market level. This created shortages during several periods in the last half of the 1970's when not everyone was able to get as much oil or gasoline as they were willing and able to buy at existing prices. Finally, prices were deregulated and temporarily rose even higher.

It took time for nationwide conservation efforts to be implemented. But by the 1980's, the conservation efforts succeeded and the higher prices of the late 1970's encouraged new supplies of oil from places like Alaska, Mexico, and the North Sea. U.S. oil consumption dropped to pre-1973 levels. Eventually, a reduction in oil prices occurred. Thus, the middle years of the 1980's seem to reflect an adjustment in the market place: demand fell while the supply rose. Such an adjustment resulted in a large drop in prices from the high levels of the 1970's.

Activity 2

A FRAMEWORK FOR ENERGY DECISION-MAKING

PROGRAM GOALS:

The learner should understand that the amount of energy resources and their availability for human activity vary.

The learner should understand the value of wise and efficient management practices which extend the useful life of the earth's energy resources.

OBJECTIVES:

Students will state the steps involved in rational decision-making.
Students will construct a decision matrix.
Students will apply the framework to sample energy decisions and use this framework for determining solutions.

KEY VOCABULARY:

Decision matrix, scarcity

MATERIALS:

Worksheets: 2A. Making Choices
2B. Decision-Making Grid

RATIONALE:

As with other economic decisions, choices about energy alternatives must be made because energy resources are scarce. This lesson provides a framework for a rational approach to making these decisions.

IMPLEMENTATION:

This section includes background material for the teacher plus a sample problem so that students can work through a matrix with the teacher in class using chalkboard or transparency.

Then the students can apply the decision-making framework to the problems posed in the Making Choices worksheet. Teachers may wish to assign selected problems from this worksheet.

Introduction:
As we learned in Activity 1, scarcity lies at the heart of economics. Scarcity means that productive resources are limited relative to peoples' wants. This forces people to make choices about how to use these limited resources to satisfy wants. Making a choice can be difficult, and it helps to use a reasoned approach to make an economic decision.

A Reasoned Approach to Decision-Making

A reasoned approach to economic decision-making involves the following steps:

1. State the problem or issue. Identify the important facts.
2. Determine the feasible alternatives.
3. Identify the criteria or goals to consider for the alternatives.
4. Evaluate each alternative according to the criteria.
5. Make a decision based on the overall evaluation.

This five-step process may not lead to a simple solution of a problem. In fact there may be several possible or acceptable alternatives. What the process is designed to do is to get you to consider the important dimensions of a problem before you make a decision.

The use of a matrix or grid to evaluate alternatives may be helpful. We introduce this framework now so that students may use it to evaluate issues that arise in later lessons. A sample grid follows. The alternative courses of action are listed in the first column, and the goals or criteria for evaluation are listed across the top row. The intersection of rows and columns creates boxes or "cells" in which to evaluate each alternative with respect to the criteria heading that column. To evaluate each alternative, the decision-maker may use a plus (+) or minus (-) mark or zero (0) depending on whether an alternative helps, hinders, or is neutral with respect to achieving the goal. Double symbols can be used when the alternative has a strong effect on goal achievement. Consider the following energy-related economic problem and use the grid framework to help make a decision:

Jim uses his car to drive to school (2 miles from home), for school programs and dates (40 miles each week), and to get to work (150 miles per week). Each week Jim spends $20 on gasoline, $5 on lunches, $10 on entertainment and $15 is saved for college and car insurance. His parents require him to save this amount and will not allow him to work any more hours. Suppose gasoline prices rose so that Jim will spend $8 more each week on fuel for his car if he continues his present routine. Since he doesn't have the extra money, he has to make some choices. What will he decide?

1. Identify the problem: (How to change Jim's budget when the price of gasoline rises.)
2. Possible alternatives are listed. (These are not the only ones.)
3. Some criteria for judging alternatives are listed. (There are others that students may use in place of or in addition to these.)
4. Evaluate each alternative in terms of the important criteria. Here we used the "+" and " - " system.
5. Make your decision. In this case the decision involves giving up part of present activities (the opportunity cost) in order to continue the others.

Example of Possible Grid Evaluation

Criteria

Alternatives	Reduce Use of Car	Maintain Lifestyle	Obey Parents	Stay Healthy	Save Time	Score Total
1. Reduce Saving by $8	-	+	-	+	+	+3-2= +1
2. Reduce entertainment	+	-	+	+	+	+4-1= +3
3. Skip lunch & cut entertainment to save $8	+	-	+	-	+	+3-2= +1
4. Share rides to save $8	+	+-	+	+	-	+4-2= +2

Reducing entertainment appears to be the best choice. Sharing rides is probably the next best choice, but it is riskier. You will probably spend more time waiting if you have to share rides (-) and you may have to reduce the independence of your lifestyle (+). (Remember, however, the conclusion could change if different weights were given to each criterion. For this example we have assumed that each criterion has equal weight.)

EVALUATION:

1. In each assigned example, have students state the problem, and identify any pertinent facts.

2. What are the alternative solutions to this problem? Encourage students to think of as many realistic choices as possible.

3. What criteria or goals should the solution meet? Point out that it may be impossible to satisfy all criteria with one choice, and that criteria may differ among students.

4. How does each alternative meet the criteria? Have students indicate how they evaluated several of their alternatives using the plus or minus system.

5. Which alternative is the best? Demonstrate that different choices will be made by different students.

6. What are the tradeoffs involved in making each choice? Student answers will include the various alternatives foregone.

7. What is the opportunity cost of each decision? After reviewing their answers to step 4, the opportunity cost is the second best alternative, that is, the best choice foregone.

Name: ______________________________ Date: ______________________________

WORKSHEET 2A

MAKING CHOICES

Here are five sample problems. Use the decision-making grid framework to help you make a choice in each situation. In each case follow the five steps: (1) Identify the problem. (2) List good alternatives. (3) Identify criteria or goals to use in considering the alternatives. (4) Evaluate the alternatives according to each goal. (5) Make your decision.

A. Mary has $[illegible],000 saved. She has no car but just accepted a new job which is five miles from her family home. She is a senior in high school and will be earning $100 per week in her job. Bus transportation is available for $2 round-trip, but there are few buses, and she must spend 1 1/2 hours daily waiting for the bus. What should Mary do for transportation to work?

B. The city of Mega (population 500,000) in considering possible solutions to its traffic problem downtown. Presently there is no public transportation system. How should Mega deal with the problem?

C. Suppose electric rates rise dramatically. While the kids watch MTV, their parents worry about cutting down on the electric heat or reducing costs in other ways. But Grandma needs a warm house, and the kids want MTV. Where should the family cut its costs to make up for the electric bill which has risen from $150 to $300 per month?

D. Suppose natural gas rates fall dramatically. Should the Guzzler's replace their old electric heat with a new more expensive gas furnace?

E. The price of gasoline doubles. Should your father trade in your great old family car for a new, smaller, more efficient model that won't use as much gasoline?

Name: ______________________ Date: ______________________

WORKSHEET 2B

DECISION-MAKING GRID

	CRITERIA					
ALTERNATIVES						TOTAL SCORE

DECISION-MAKING GRID

	CRITERIA					
ALTERNATIVES						TOTAL SCORE

Activity 3

TRADE-OFFS IN ENERGY CHOICES

PROGRAM GOAL:

The learner should understand that the amount of energy resources and their availability for human activity vary.

OBJECTIVES:

Students will identify the trade-offs involved in social decisions.
Students will compare the costs and benefits of alternative decisions using a decision-making grid.
Through role playing, students will determine that individual perspectives on a social question may differ.

KEY VOCABULARY:

Trade-off

MATERIALS:

Worksheets: 3A. Woodland City Occupation Sheet
3B. Role-playing Exercise --Woodland City

RATIONALE:

When people choose to do one thing instead of another they are making a trade-off. That is, they are giving up one thing for something else. Energy decisions require trade-offs too. For example, a choice to produce more energy can come at the expense of environmental preservation. This lesson looks at this energy-environment trade-off using a role-playing exercise and a decision-making grid to analyze the problem.

IMPLEMENTATION:

Have students play various roles suggested for the imaginary town of Woodland City at a simulated town meeting. Distribute student worksheet which provides the information needed to conduct the role-playing exercise. Assign a role to each student from "Woodland City Occupation Sheet." Any except #1 (the mayor), #11 (manager), #13 (store owner), and #14 (development specialist) can be played by more than one student. (See note at end of Woodland City Occupation Sheet.)

EVALUATION:

"Citizens" will vote on building the power plant. Before the vote, discuss the questions found at the end of the students' worksheet with the class or have the students write responses to one or more of these. Also, review the decision-making grid framework for "citizens" to analyze their alternatives. See example below.

Sample Grid for Environmentalist

Criteria

Policy Alternatives	More Jobs	Clean Air (x2)	Less Expensive Power Area	Preserve Park	Total Score
Build Power Plant	+	- -	+	-	+2-3= -1
Don't Build Plant	-	+ +	-	+	+3-2= +1

Based on this decision grid and the information provided, the best choice appears to be not to build the power plant.

Name: ______________________________ Date: ______________________________

WORKSHEET 3A

WOODLAND CITY OCCUPATION SHEET

1. You are the mayor of Woodland City. It is your job to run the meeting. You are concerned about the high unemployment rate in your city.

2. You are a representative of the electric company. Your company has a great deal of money and has given you authority to make promises to the residents . . . just get them to vote YES on the coal-fired power plant.

3. You are an environmentalist. You know that if the coal-fired power plant is built, trees will be cut down, and birds and animals will be driven from their homes in a forest near the national park.

4. You are a farmer who owns the forest land the electric company wants to buy. They have offered you great price for the land. You are getting old and want to sell the land at this price.

5. You own the farm next to the proposed location of the new power plant. You are afraid by-products from the plant will harm your cattle and/or your land.

6. You are an unemployed worker. You think the power plant might hire you.

7. You are a housewife in Woodland. You are tired of the dust from the coal mines and think it may be harmful to your children. You don't want another coal mine!

8. You are a logger at the lumber mill. You feel if the power plant is developed, trees will be cut down and you will be forced to close the saw mill. You have three children and must earn a living.

9. You are a student. Your friends and you enjoy the national park. You are afraid that if the town says "yes" to the power plant, the park may become less scenic.

10. You are an older resident of Woodland City. You no longer work and are afraid if electric rates continue to go up, you will not be able to afford to pay your utility bills.

11. You are the head park ranger at the national park. You have worked several years to develop the park and don't want its beauty destroyed by a huge power plant.

12. You own one of the existing coal mines. If the power plant comes into being, you may have to pay your workers more because of higher wages at the new mine or the electric company may buy coal from your mine which raises the demand and maybe the price you can charge. You decide which viewpoint seems most realistic.

13. You own the grocery store in Woodland. If the power plant employs more people, that means more business for your store.

14. You are a land development specialist. You have wanted to use that same tract of land for a new housing development.

15. You are a resident of Woodland. You are not sure how you feel about the issue but as you listen at the meeting you may form an opinion or idea and wish to speak.

Note to Teacher: Each student should be assigned a role. The easiest way to do this might be to copy this sheet and clip out each numbered item. Then pass these out to students and assign the role they get. Any on the list, except #1, #11, #13, and #14 can be assigned to more than one student. While you are assigning roles, have each student think of a name that represents their role and make a name tag to wear during the town meeting. You also might want to make and distribute copies of the decision-making grids from the worksheet in activity 2.

Name: ______________________ Date: ______________________

WORKSHEET 3B

ROLE-PLAYING EXERCISE WOODLAND CITY

Each of you is a citizen of Woodland City. You will be given a description of your role by your teacher. You are to pretend you are this person - act like they would act, say what they would say.

The town council has called a meeting because a representative from an electric company is in town to try to persuade the town council to approve the building of a large coal-fired power plant just half a mile from town.

You will be given a chance to speak at the meeting. Remember you are representing a different person than yourself!

Important Facts About Woodland City:

1. There are two large coal mines near the city. They employ 1000 people but the streets of Woodland City are often filled with coal dust.
2. As of today, 500 Woodland City residents are out of work.
3. A large forest surrounds Woodland City. A national park is three miles south of town.
4. The price of electricity in Woodland is well above the national average.
5. The largest industry in Woodland City is logging.
6. A large river flows south of the town.

Important Facts About the Electric Company:

1. The company plans to expand coal mining around Woodland City to generate the electricity.
2. The company promises to sell some of the electricity to Woodland residents bringing down the price of electricity.
3. The company is the largest electric company in the country.
4. The company is planning to supply electricity to 50,000 consumers using the new plant.

The meeting is about to begin . . . don't be late!
The mayor will call the meeting to order.

Questions to Consider:
1. What resources did Woodland City have that the Electric Company needed?

2. What resources did the Electric Company have that would benefit Woodland City?

3. What resources might be destroyed if the power plant is built?

4. List advantages (benefits)/disadvantages (costs) for building the power plant in Woodland City.

5. Are the benefits of having the power plant built worth the costs of building it?

6. Each student should consider the trade-offs for their citizen's role if the plant is built. (For example, the mayor may have added responsibility and lose environmentalists' votes.)

Activity 4

OPPORTUNITY COST AND ENERGY

PROGRAM GOALS:

The learner should understand that the development of energy resource and the use of these resources create impacts on environmental and economic systems.

The learner should understand that the amount of energy resources and their availability for human activity vary.

The learner should understand that energy sources, technology, and consumption patterns of the future may be different from those of the past or present.

OBJECTIVES:

Students will identify examples of opportunity costs.
Students will give examples of opportunity costs involved in decisions.
Students will identify opportunity costs in a role playing situation where economic decision-making is simulated.

KEY VOCABULARY:

Opportunity costs

MATERIALS:

Worksheet:	4A. Opportunity Costs

RATIONALE:

The opportunity cost concept is one of the most important ideas in economics. It helps people see that the real cost of an economic decision is not just the money cost but the best alternative that is passed by. In making a choice for one thing, we give up something else.

IMPLEMENTATION:

Students may take notes on teacher's lecture on "Opportunity Cost and Energy." Students will discuss suggested examples (or others). Following the lecture each student will do the worksheet. Discuss student answers to this worksheet.

Opportunity Cost and Energy: Lecture
An important idea used in analyzing economic problems is the concept of opportunity cost. Opportunity cost is not always measured in dollars, but it can be defined as the "best alternative passed by" when a person makes a choice among several possible opportunities which would use the same resources. Because of the problem of scarcity, people cannot have everything they want or need. They must make choices. The best alternative that is given up when a choice is made represents the opportunity cost of that decision.

Let's look at some examples to illustrate this point:

1. You may have two invitations to parties on Saturday night and you want to go to both. However, you can only accept one invitation. The opportunity cost of accepting one is the other party you give up.

2. A piece of land can be used for farming or for a park. It cannot be used for both. If it is used for a park, the opportunity cost is the crop that could be grown as well as the peaceful atmosphere that exists without campers and picknickers. If it is used for farming, the opportunity cost is the loss of recreational activities that could be enjoyed in the park.

3. You can attend a college after high school or go to work at your uncle's store. The cost of attending college includes the income you are giving up plus the money you pay for tuition, books, etc. The opportunity cost is the other things you gave up by not having this money available. If you had gone to work for your uncle, the opportunity cost includes a college education plus the probability of higher future income.

4. When a city has vacant land that can be used for housing or a parking lot, what are the opportunity costs involved in deciding on one or the other?

5. What about energy? What opportunity costs are involved in driving to the store rather than walking? In leaving the lights on in a room that no one is using?
As consumers and citizens we should consider opportunity costs of our decisions. Remember, the dollar cost alone probably does not measure the opportunity cost of each choice. What is the best choice to make? We should choose the alternative that provides enough satisfaction to override the "costs" of the best alternative that was given up.

People may look at the same choice and make very different decisions because opportunity costs will differ depending on their beliefs, ages, personal circumstances, etc. The following worksheet will help you understand that problem and give insight into why energy production and use is such a controversial issue.

This activity is based on a lesson in **Energy Tradeoffs in the Marketplace**, a unit developed by the Washington State Superintendent of Public Instruction Office and the Washington State Council on Economic Education (Seattle: 1980). Most teachers will want to expand their presentation and tailor it to their students' situation. This lecture is intended only to provide ideas.

EVALUATION:

Questions for discussion on Worksheet 4A: Opportunity Cost.

1. What are the scarce resources used in this economic decision? (time, fuel, private income, public funds)

2. What are alternative uses of these resources?

3. Will the opportunity cost of a "yes" decision be the same for everyone? Why?

4. Which people would be likely to support the plan? Why?

5. Which people would be likely to oppose the plan? Why?

6. Why do people disagree over resource uses?

7. Discuss students' answers to questions about opportunity cost for each example.

Name: ______________________________ Date: ______________________________

WORKSHEET 4A

OPPORTUNITY COSTS

You must vote "for" or "against" a suggested public transportation proposal using your decision-making skills and applying the idea of opportunity cost. Pretend you are in the following roles and decide how each person should vote on the following recommendation:

Your town, Squaresville, proposes purchase and operate a small bus between Squaresville and a larger city, Rocktown, 20 miles away. Many people in Squaresville work and shop in Rocktown. The bus would make two round-trips each day: One bus is scheduled to meet working hours of 8:00 a.m. to 5:00 p.m. in Rocktown, and the other bus goes at 10:00 a.m. and returns at 3:00 p.m. Bus tickets will cost about the same for one person as it would for that person to drive a mid-size car. Local taxes will be increased by about 3% to help pay for this bus. ($36 per year for the average homeowner.)

Role I: Herman: 18 years old from Squaresville. Owns used car. Works part-time (8:00 a.m. until noon) in grocery in Rocktown.

Opportunity Cost "Yes" Vote:

Opportunity Cost "No" Vote:

Your Vote______

Role II: Mr. & Mrs. Snurd: Married couple. Young, no children, own large home in Squaresville, and both work in Rocktown. Each drives own car to work. (Her job 8:00 a.m. to 3:00 p.m.; his job 9:00 a.m. to 5:00 p.m.) His job requires frequent use of car on 3 or 4 days each week.

Opportunity Cost of "Yes" Vote:
For Her:
For Him:

Opportunity Cost of "No" Vote:

For Her:
For Him:

His Vote_______
Her Vote_______

Role III: Joe Shmo: Forty years old from Squaresville. Family of four. Works in plant on bus route halfway to Rocktown. Now he drives the family's only car.

Opportunity Cost of "Yes" Vote:

Opportunity Cost of "No" Vote:

Your Vote_______

Role IV: Susan Sunshine: Eighteen years old, senior in Squaresville High School, hardly ever goes to Rocktown because she doesn't own a car.

Opportunity Cost of "Yes" Vote:

Opportunity Cost of "No" Vote:

Your Vote_______

Role V: The Oldey's, retired Squaresville couple with poor eyesight. Like to go to Rocktown, but driving is difficult in rainy or snowy weather.

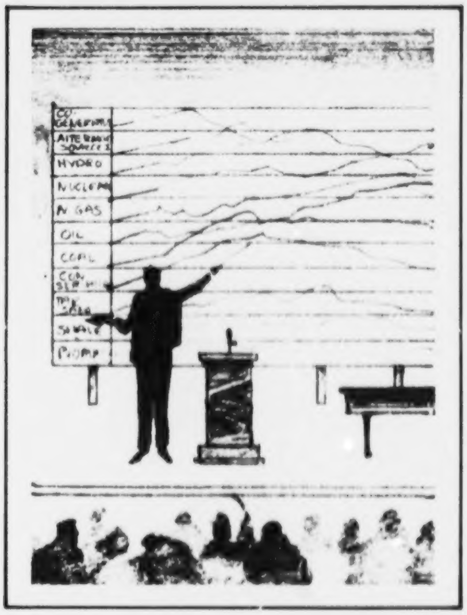
Opportunity Cost of "Yes" Vote:

Opportunity Cost of "No" Vote:

Your Vote_______

Activity 5

SOURCES OF ENERGY



PROGRAM GOALS:

The learner should understand that there are many sources of energy.

The learner should understand what energy is or how it can be converted from one form to another.

The learner should understand that the amount of energy resources and their availability for human activity vary.

The learner should understand the value of wise and efficient management practices which extend the useful life of the earth's energy resources.

OBJECTIVES:

Students will identify several different types of energy sources.
Students will research one type of energy source and write about its prospects for future use.
Students will read and interpret several types of graphs relating sources of energy.
Students will construct graphs given sets of energy data.

KEY VOCABULARY:

National Energy Act, conservation, synthetic fuels, renewable energy resources

MATERIALS:

Worksheets: 5A. Sources of Energy
5B. Graph Interpretation

RATIONALE:

In 1978, Congress passed the National Energy Act which established the nation's energy goals with an emphasis on encouraging efficient use and assuring an adequate supply. This activity will examine our progress in meeting these two goals. It will also give students an overview of alternative sources of energy, and practice in reading and constructing graphs which compares energy data.

IMPLEMENTATION:

A. Reports: background information summarizing alternative energy sources is provided. Divide the students into seven or eight groups or assign individuals to work on reports, each covering one of these energy sources and its prospects for future use. This assignment could be combined with a library exercise on using the Reader's Guide to Periodical Literature, for example. The teacher may want to have the students focus on specific questions in their research such as:

1. What are the potential costs of developing this fuel source?
2. What are the benefits of this fuel source?
3. What is the environmental impact of using this fuel?
4. What is the future feasibility of using this fuel source? Is it better for some locations than others?

B. Graphs: Worksheets will be distributed to students for them to complete after the teacher explains each one.

Circle or Pie Graphs:
It is important to teach students how to estimate percentages of a circle. To be exact, students will need a protractor to construct circle graphs.
Remind students that circles measure 360 degrees, thus 27% of a circle = .27 x 360 or 97 degrees.

Bar Graphs:
Watch for relevant choice of units on the vertical scale, even spacing of units, and width of bar.
The height of bars should depict data as precisely as possible for easy visual comparisons.

Line Graphs:
As with bar graphs, the choice of units on the vertical as well as horizontal axis is important. The scale should be relevant and units spaced evenly according to equal values. Points should be placed so that both vertical and horizontal coordinates line up according to data.

EVALUATION:

The written reports could be due at the end of an entire "Energy and Economics" unit. The teacher may want to have the students present them orally and discuss their findings.

Graphing exercises may be done in class or as a homework assignment.

Name: ______________________ Date: ______________________

WORKSHEET 5A

SOURCES OF ENERGY

In 1978, Congress passed the National Energy Act which sets out the nation's energy goals and serves as a guide to energy activities. Its overall goals are to:
--encourage the most efficient use of existing energy supplies.
--assure an adequate future supply of energy
--achieve energy independence

Despite achievements toward these goals, especially with regard to more efficient energy use, the U.S. was still a net importer of energy, especially of petroleum in 1987. Consumption has continued to exceed production in every year since 1953. The following alternative sources may change this situation.

Conservation

Americans are already using energy more carefully. From 1973 to 1983 the growth rate of energy consumption slowed dramatically as prices soared. Consumption per person actually declined in several years of that decade. Projections for energy consumption in 1990 were revised downward by as much as 20 percent. One study showed the U.S. saved the equivalent of 1.3 billion barrels of oil between 1973 and 1978. (A barrel is 42 gallons.) Thus we can think of conservation as a type of productive investment and a cheap, clean, and fast way of decreasing dependence on foreign imports.

Oil and Natural Gas

Responding to higher prices, domestic producers increased oil exploration activities and this resulted in an expansion in proved oil reserves in 10 states in 1979 alone. Gas reserves increased in 17 states. In 1981, the number of active rigs had grown to its highest level in history--4,530. In September of 1988, active rigs numbered 927 reflecting the subsequent price declines in the late 1980's.

Coal

Coal is the most abundant U.S. fuel comprising more than three-fourths of the known recoverable energy reserves. At 1987 levels the U.S. coal reserves could sustain production for almost 300 years. The U.S. has more than half of the non-Communist world's coal resources. However, coal can create environmental problems in mining and burning. But despite the cost of environmental controls, the cost of using coal still falls below the cost of using oil. The use of coal which had declined through most of the 20th century began to increase in the mid-1970's. Further expansion of coal use may occur through liquefaction and gasification. Then it can be used as oil or natural gas.

Nuclear Energy

In 1987, nuclear plants provided less than 7% of U.S. energy consumption. The use of nuclear power has created serious debate over the safety and availability of uranium enrichment and processing services, and spent fuel disposal. Also, there is continued concern over human error such as occurred in the Three Mile Island, Pennsylvania plant and the Chernobyl plant in the Soviet Union.

Synthetic Fuels

Coal to Gas or Oil:

Gasification of coal is accomplished by reaction of coal with oxygen and steam. The gases produced are cleaned and converted to methane, the major ingredient in natural gas. Several gasification processes are used commercially in other countries and they are being developed here with government aid.

Liquefaction may be done by a controlled heating process, by solvent extraction, by hydrogenation of coal, or indirectly by conversion to gases and then to liquid products.

Coal conversion efficiencies range from 60 to 80 percent compared to about 40 percent for power generation with coal. Thus converting to gas or liquid improves utilization of coal resources.

Oil from Shale or Tar Sands:

Shale rock contains kerogen, a solid which is partially formed oil. Oil is released through a heating process which can be done below the surface where the rock is found or after the rock is mined and brought to the surface. The costly processes are not yet competitive with the lower cost of oil extraction.

Similar extraction methods can be applied to tar sand which are sands heavily saturated with oil and tar.

Biomass Conversion:

There are many ways that organic materials can be converted to fuel. A few of these include direct burning, conversion to alcohol, and use of bacteria to break down organic waste to form methane.

Renewable Energy Resources:

Biomass conversion is both synthetic and renewable, but strictly renewable resources are solar power, geothermal power, hydropower, wind power, and tidal forces.

Solar power may be passive, using architectual designs which take advantage of site and building materials. Also there are active solar systems such as thermal systems involving pumps, fans and fluids, or photovoltaic systems involving conversion of sunlight directly into electricity.

Geothermal energy comes from heat deep within the earth. Research is also being conducted on new ways to harness wind and tidal energy.

Hydropower is created when moving water such as over a dam turns electrical generators.

Together these sources constitute about 9% of total U.S. energy production.

Sources and Types of Energy is based on information in **Something Special for Teachers**, part of the SEED program (Schoolhouse Energy Efficiency Demonstration), Houston, TX: Tenneco, Inc., 1981, pp 3-8; Monthly Energy Review, (Dept of Energy) and World Eagle, December 1987 issue.

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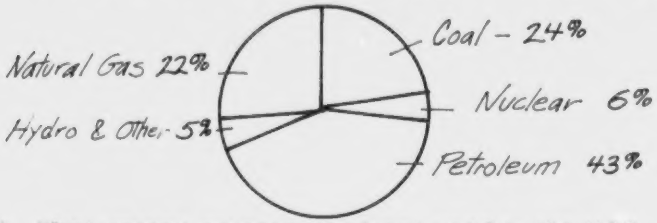
WORKSHEET 5B

GRAPH INTERPRETATION

A. Below is a circle or pie graph. It is used to picture how shares of something are divided among various uses or users. Answer the questions using these graphs:



1987 U.S. Energy Consumption

1. What energy sources are least used in the U.S.?

2. What energy source is most used in the U.S.?

3. Complete the columns below listing (in order) from largest to smallest the types of energy used in the U.S.

United States	%

4. Which source provided almost one-fourth of energy used?

5. Which source provided just over one-fifth of energy used?

6. One-fourth of the pie graph is equal to ______%.

7. Which source provided about four times as much energy as nuclear and hydro energies combined?

8. Construct a pie graph to show the following information about 1985 types of world energy production: Natural gas 22%, Coal 28%, Hydro 7%, Nuclear 5%, Petroleum 38%.

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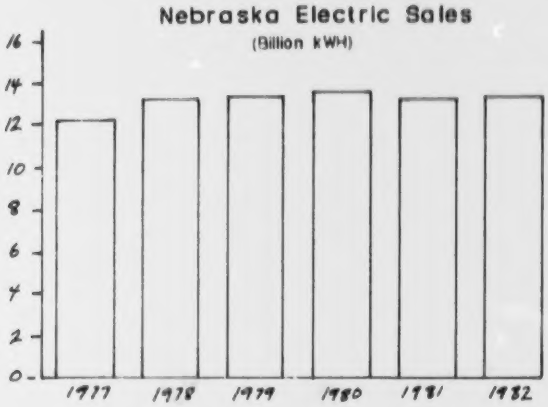
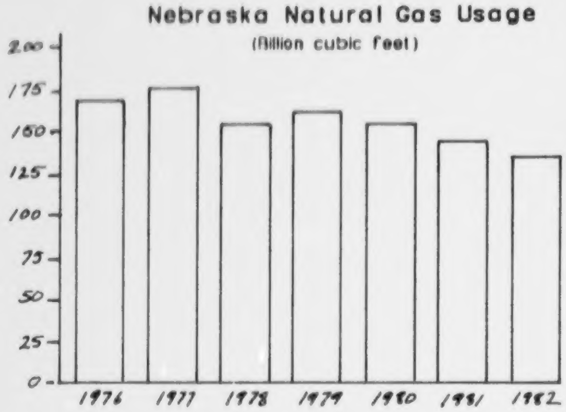
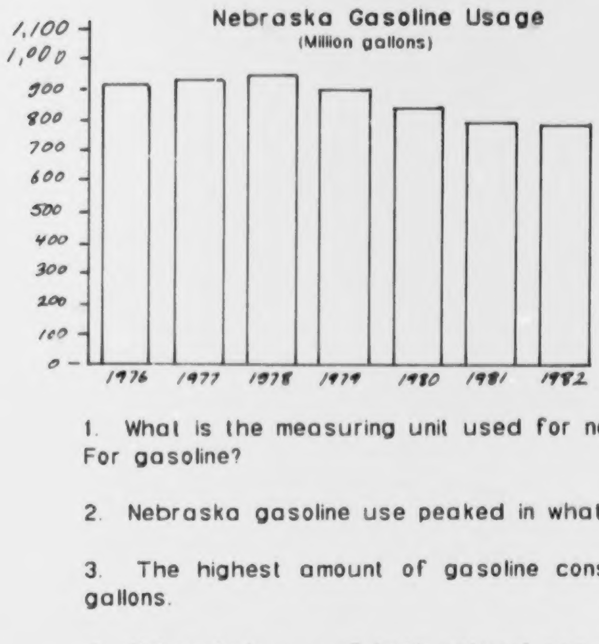
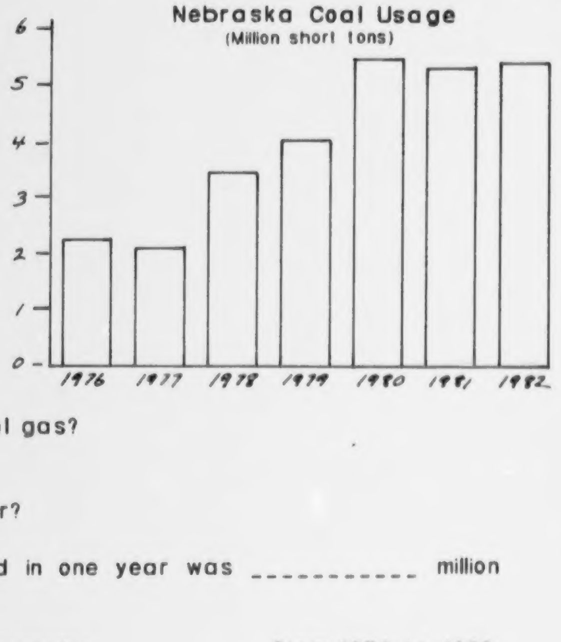
B. These are bar graphs. Bar graphs are often used to compare quantities used or produced in various time periods. Answer the following questions:









1. What is the measuring unit used for natural gas?
For gasoline?

2. Nebraska gasoline use peaked in what year?

3. The highest amount of gasoline consumed in one year was ___________ million gallons.

4. Nebraska's use of both natural gas and gasoline __________ from 1976 to 1982. (decreased, increased)

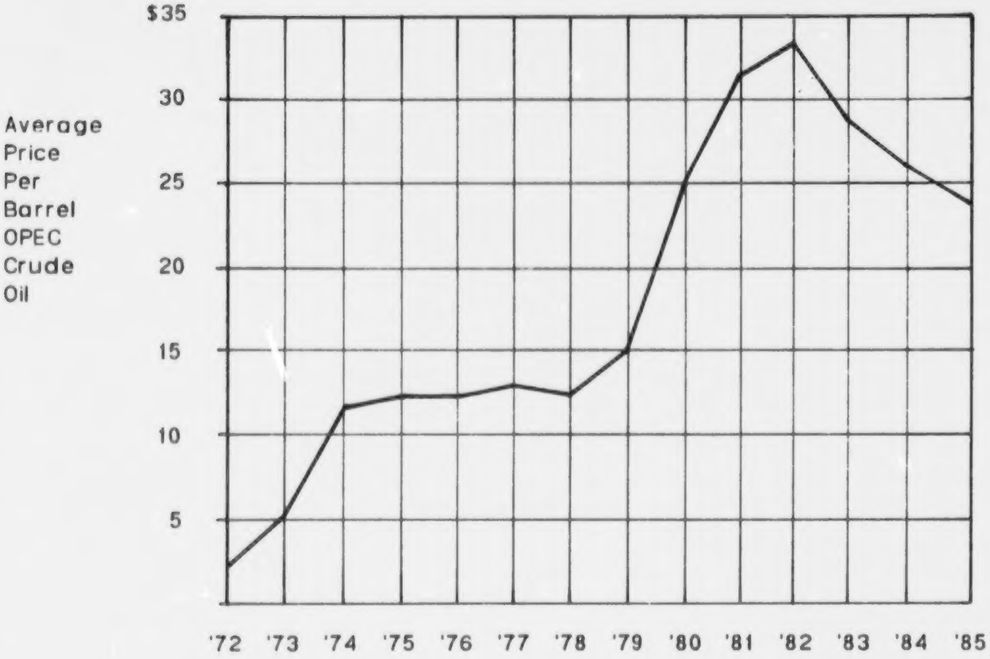
5. Is there enough information in the graphs to tell why energy use changed from 1976 to 1982?

6. What kinds of other information might tell us the reasons for change?

7. Construct a bar graph comparing U.S. energy prices by source with the following 1984 information (measured in $ per million BTU): Electricity $19.29, Petroleum $7.62, Natural Gas $4.74, Coal $1.71, Nuclear $.67.

C. This is a line graph. Line graphs connect points which relate two variables. In this graph the points show average Arab oil prices in various years. Line graphs are used to determine at a glance whether a trend or regular relationship exists between the variables.

Line Graph on Oil Prices/Barrel



1. During 1972-1982, this graph shows that the lowest oil price was about $________per barrel in ________, and the highest oil price was $________ per barrel in ________.

2. This graph shows that the OPEC price during 1972-1985 (increased or decreased)?

3. Prices were generally stable during what time period? (years)

4. According to the graph, the price fell from $_______ in 1982 to $_______ in 1985.

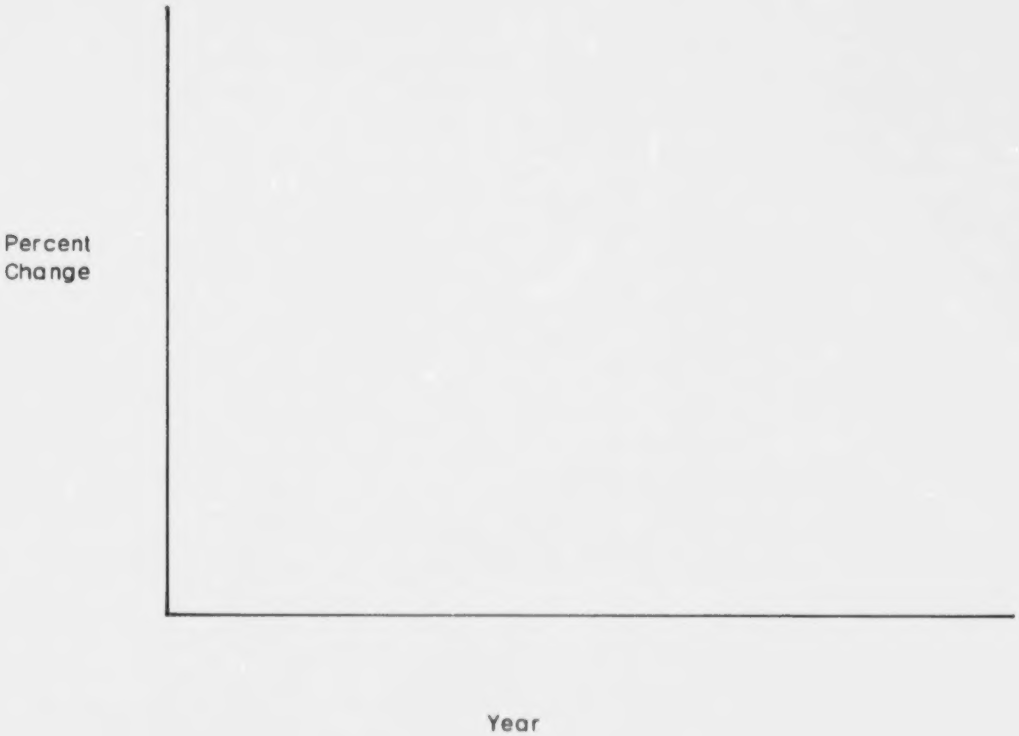
C.

Percent Changes in Energy Prices, 1974-1982

Year	Percent Change
1974	22
1975	12
1976	7
1977	7
1978	8
1979	37
1980	18
1981	12
1982	2

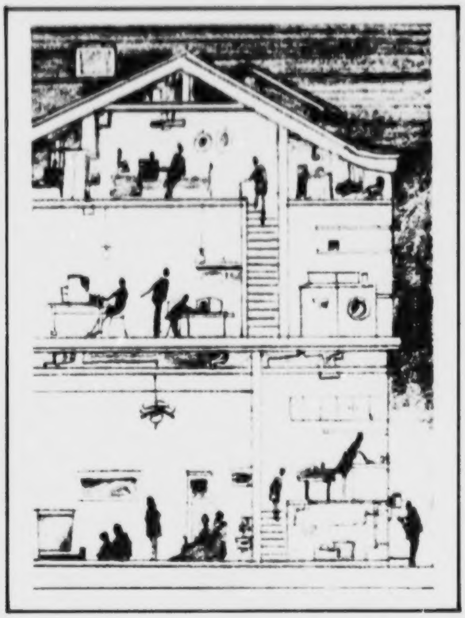
Source: Joint Economic Committee of U.S. Congress, **Economic Indicators, December 1982.** Washington; U.S. Government Printing Office, 1982, p.24.

5. Construct a line graph showing percentage changes in U.S. energy prices, 1974-1982, from the information given above.



Activity 6

MEASUREMENT OF ENERGY CONSUMPTION



PROGRAM GOAL:

The learner should understand the value of wise and efficient management practices which extend the useful life of the earth's energy resources.

OBJECTIVES:

Students will list essential and nonessential uses of energy based on their choices about energy usage the previous day.
Students will estimate monthly costs of their electricity use, and compare cost of nonessential uses to total.
Students will read electric meters to measure consumption over a specific period.
Students will compare electricity usage over different time periods.
Students will describe the law of demand using electricity as the example (e.g., There is an inverse relationship between price and quantity of electricity consumed.)
Students will identify other factors (besides price) which may influence the demand for electricity.

KEY VOCABULARY:

Energy consumption, law of demand, kilowatt-hour

MATERIALS:

Handout:	Fact Sheet: Typical Operating Costs for Electric Appliances
Worksheets:	6A Measuring Energy Consumption 6B Record of Daily Electricty Use in my Home

RATIONALE:

Energy consumption, particularly electricity consumption, often occurs without the consumer being aware of the amount being used. This activity teaches students how to measure electricity consumption and increases awareness of the inverse relationship between price and quantity consumed.

IMPLEMENTATION:

Consumption: Have each student write a brief summary of their previous day's activities which required electricity use. Through class discussion, students can be made aware of the more subtle electricity uses as well as the obvious ones. For example, the telephone requires electricity, nearly all food uses electricity at some point in preparation, pop machines use electricity, etc.

Have students divide their lists into "essential" and "nonessential" uses. Pass out Fact Sheet on costs and have students estimate total monthly costs of their electricity use and how much they could save by eliminating nonessential uses.

Measurement: Distribute student worksheets and discuss (if the utility in your area uses meters). Changing technology will eventually replace meters with electronic devices.
Do exercises in class on worksheet "Measuring Energy Consumption."

Have students keep the worksheet "Record of Daily Electricity Use in my Home" at home for one week to record meter readings and complete questionnaire. Collect and discuss at the end of week during unit.

EVALUATION:

Answers to Worksheet : 6A Measuring Energy Consumption

a. 40
b. 80
c. 160
d. Watts
e. 200w
f. 180; 540
g. 2000
h. one-half
i. 5000
j. Number of light fixtures times 40; Divide by 1,000
k. 1000
l. 1000
m. 100
n. 900
o. 20
p. 6
q. 1926
r. 4482
s. 6044
t. 1562
u. 4692
v. 4482

B. 1.a. 419 b. $8.60 c. $5.69 d. $14.29
2. Should be $17.96 ($8.60 + $9.36)

Answers to Worksheet: 6B. Record of Daily Electricity Use in My Home
These questions are designed to help students define the law of demand using electricity as the example.

4. With a 1% price increase, the quantity of electricity consumed would decrease only slightly or not at all. A 10% price increase would cause a greater decrease in electricity consumption. A 50% price increase would lead to an even greater decline in electricity consumption.

5. There is an inverse (negative) relationship between price and the quantity of electricity consumed. (An illustration of the law of demand.) As price increases, the quantity of electricity decreases.

6. With a 1% price decrease, the quantity of electricity consumed would probably only increase slightly or not at all. With a 10% price decline there would be a greater increase in electricity consumption. The greatest increase in electricity consumption would come with a 50% price decline.

7. There is an inverse (negative) relationship between price and the quantity of electricity consumed. (An illustration of the law of demand.) In this situation, as price declines, the quantity of electricity consumed increases.

HANDOUT

FACT SHEET
TYPICAL OPERATING COSTS FOR ELECTRIC APPLIANCES

Appliance	Average Cost Per Hour (cents)	Appliance	Average Cost Per Hour (cents)
Food Preparation		**Comfort Conditioning**	
Blender	2.3	Blanket (electric)	1.0
Deep fryer	8.5	Dehumidifier	1.7
Electric frying pan	7.0	Fan (window)	1.3
Garbage disposal	2.6	Fan (circulating)	.6
Microwave	8.8	**Air Conditioning**	
Mixer (hand)	.7	12,000 Btu (window)	12.0
Toaster	8.8	18,000 Btu	19.3
Range (bake)	16.7	30,000 Btu	30.6
Range (surface unit)		36,000 Btu	35.9
6" Unit on High	8.2	**Health and Beauty**	
8" Unit on High	15.3	Curling iron	.2
Utility		Hand hair dryer	5.9
Clock	9.0/mth	Shaver	1.0/mth
Dishwasher	7.1	**Home Entertainment**	
Dryer	28.7	Radio	.4
Fluorescent light (40w)	.2	Stereo	.6
Incandescent lgiht (100w)	.6	T.V. (19")	
Iron	6.4	B & W (solid state)	.3
Vacuum	3.7	Color (solid state)	.9
Washer	3.0	Satellite dish antenna	.4
Water Bed (heated)	2.2	VCR	.2
Water Heater	26.5		
Food Preservation			
Freezer (frostless)	2.6		
Refrigerator/Freezer			
15 cu.ft. Frostless	3.6		
15 cu.ft. Regular	1.9		

Costs are calculated on the average residential rate of 5.88 cents per kilowatt-hour. To calculate local cost of any appliance in another location, use the following procedure:

$$\frac{\text{wattage X hours of use}}{1000} = \text{Kwh}$$

$$\text{kwh X local electric rate} = \text{average operating cost}$$

Note: Summer and winter season rates may differ.

Source: Lincoln Electric System, Home Energy Saving Tips, (Lincoln, NE: Lincoln Electric System, 1987).

Name: ______________________________ Date: ______________________________

WORKSHEET 6A

MEASURING ENERGY CONSUMPTION

A. WHAT IS A KILOWATT-HOUR?

Take a look at an ordinary light bulb and you will notice that its wattage is indicated. For example, the bulb might read 100 watts, 60 watts, 40 watts, and so on. The wattage marked on a bulb indicates the amount of electricity that bulb will use in one hour.
For example, a 100-watt bulb will use 100 watt-hours of electricity in 1 hour. Similarly, a 60-watt bulb will use 60 watt-hours of electricity in 1 hour.

Since a 40-watt bulb will use (a)________ watt-hours of electricity in 1 hour, then the same bulb will use (b)_________watt-hours of electricity in 2 hours. How many watt-hours of electricity will a 40-watt bulb use in four hours? (c)____________.
To answer this question, you must multiply. You find that a 40-watt bulb will use 4x40 watt-hours of electricity in four hours.

Answer the following:
(d) A 100-watt bulb will use 100 __________ of electricity in 1 hours.

(e) Two 100-watt bulbs will use _________ of electricity in 1 hour.

(f) How many watt-hours of electricity will 3 60-watt bulbs use in 1 hour? in three hours?

Because the average home will use several thousand watt-hours of electricity in one month, it is more convenient to measure the amount of electricity in a unit larger than the watt-hour. One kilowatt-hour is equal to 1000 watt-hours. REMEMBER that a kilowatt-hour is larger than a watt-hour.
If five 200-watt bulbs were used for one hour, they would use a total of 5 times 200 watt-hours or 1000 watt-hours or 1 kilowatt-hour.

Two kilowatt-hours equal (g)________watt-hours.

500 watt-hours equal (h)________of a kilowatt-hour.

How many watt-hours equal 5 kilowatt-hours? (i)_____________
(j) If each fluorescent tube in the lighting fixtures in your classroom is labeled 40 watts, how many watt-hours of electricity is being used in 1 hour? How many kilowatt-hours in 1 hour?

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B. HOW ELECTRIC BILLS ARE COMPUTED

SAMPLE ENERGY CHARGE

First 200 kwh at	$ .0430 per kwh
Next 1300 kwh at	.0260 per kwh
Over 1500 kwh at	.0215 per kwh
Total kwh at (Fuel Clause)	.00215 per kwh

SAMPLE BILL COMPUTATION: Suppose that your total electricity consumption for the month amounted to 500 kwh. The charge for this monthly consumption would be figured out in this way.

First 200 kwh at $.0430	$8.60
Next 300 kwh at $.0260	$7.80
Total of 500 kwh at $.00215	$1.08 (Fuel Clause)
Total	$17.48

COMPUTING ELECTRIC BILLS

Work all problems on this paper showing the calculations for each. Use the sample rate schedule to do these.

1. Mr. Collins read his meter at the beginning of May. It read 4335 kwh. When he subtracted the April reading of 3916, he found the number of kilowatt-hours he used in one month. What would his electric bill amount to in Green Bay?

a. Subtract b. First 200 kwh? c. Next 1300 kwh? d. Total? (add b&c)

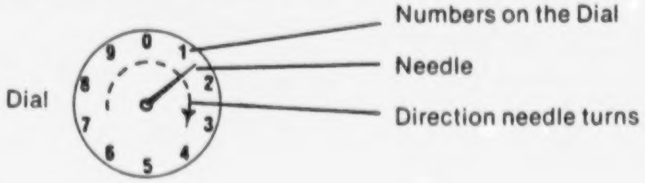
2. Can you find an error in this bill?

Mr. J.J. Jones
111 Energy Blvd.
Antsville, Indiana 60761

Previous meter reading	Present meter reading	No. kwh. Used	Amount to be paid
3569	4129	560	$20.16

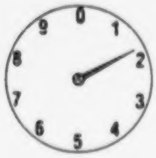
LEARNING ACTIVITY ON METER READING

The amount of electricity you use is measured by a METER attached to your house or apartment. An electricity meter has dials on which one or more needles will point to the number of kilowatt-hours of electricity that you have used since the meter was installed. One of the dials on the meter will look like this:



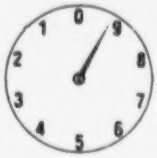
STUDY THE ILLUSTRATION BELOW:

This dial counts units of 1000 kwh each.



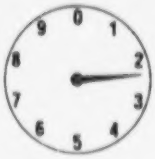
Dial A

This dial counts units of 100 kwh each.



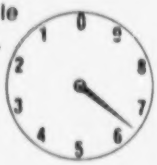
Dial B

This dial counts units of 10 kwh each.



Dial C

This dial counts single kwh.



Dial D

Dial A. The needle turns in a clockwise direction.

Dial B. The needle turns in a counterclockwise direction.

Dial C. The needle turns in a clockwise direction.

Dial D. The needle turns in a counterclockwise direction.

As the needle turns in a clockwise or counterclockwise direction, it counts one unit of electricity used. The number of units counted is THE LAST NUMBER PASSED BY THE NEEDLE.

The diagram on the preceding page of the single dial shows that one unit of electricity has been counted.

STUDY THE second illustration carefully to notice that several dials are needed to count the total number of units of electricity used in a home. The reason for the four dials is that each dial can count only ten units, so each dial as explained will count a unit of a different size.

Notice that the needle on Dial A has just passed the number 1. Therefore, this needle has just counted one unit that measures (k)_______(1, 10, 1000) kilowatt-hours. Dial A measures (l) ____________kilowatt-hours.

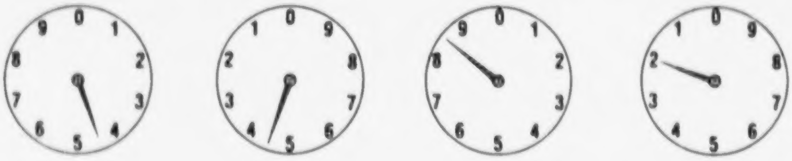
The needle on Dial B has just counted the number 9. This needle has just counted 9 units, each measuring (m)____________ (9, 100, 900) kilowatt-hours. Dial B reads (n)_______(9, 100, 900) kilowatt-hours.

The needle on Dial C has just counted the number 2. Dial C read (o)_____(2, 10, 20) kilowatt-hours.

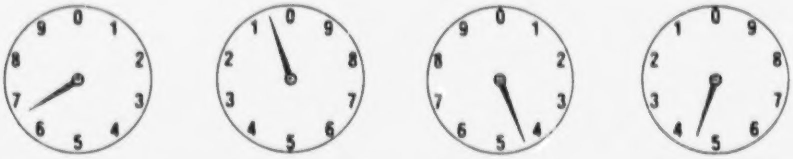
The needle on Dial D has just counted the number 6. Dial D reads (p)____(6, 60, 1) kilowatt-hours.

In order to get the total reading of the electricity meter shown above, we must add together the readings on Dials A, B, C, and D. In other words, we must add to get a total of (q)____ kilowatt-hours.

Each month a man from the power company is sent to your home to read your electricity meter. His job is to determine how much electricity you used during the month. For example, suppose your meter looked like this in the month of April:



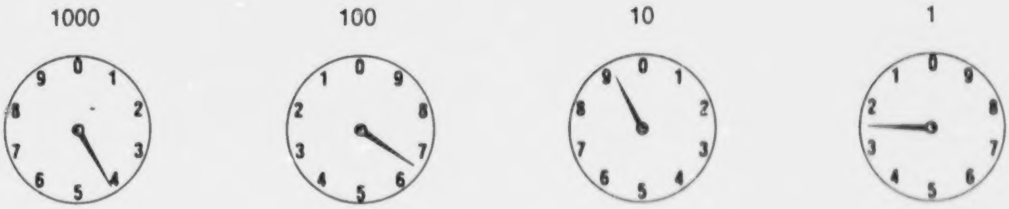
According to the meter, you have used to date (r)_______kilowatt-hours of electricity. In May, the person from the power company makes another reading.



He finds that your electricity meter now reads (s)________kilowatt-hours. Since the April reading, you have used (t) ________kilowatt-hours. You find this by subtracting the April reading from the May reading.

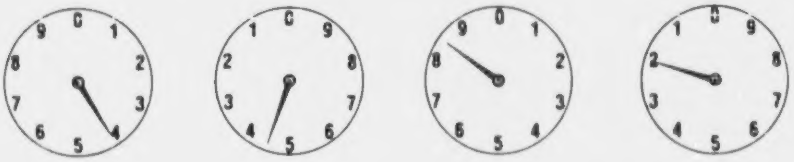
YOU SHOULD NOW BE ABLE TO FIND AND READ THE METER FOR ELECTRICITY IN YOUR OWN HOME.

Study the meter below.



According to your calculations, this meter shows that a total of (u)_______kilowatt-hours have been used.

The meter shown below reads (v)_____________kilowatt-hours.



Name: ______________________ Date: ______________________

WORKSHEET 6B

RECORD OF DAILY ELECTRICITY USE IN MY HOME

Select the same time each day to measure your family's use over 24 hours.

	Date and Time	Electric Meter Reading (kwh)	Kilowatt-Hours (Subtract readings at 24 hour intervals to get daily use)
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Last reading on Day 8			

Questions:

1. On which day did your family use the most electricity?

2. Why do you think they used more on that day?

3. Could your family cut down on electricity use? If so, name the ways.

4. What would probably happen to your family's electricity consumption if the price of electricity per kwh would increase:

   a. By 1%? b. By 10%? c. By 50%?

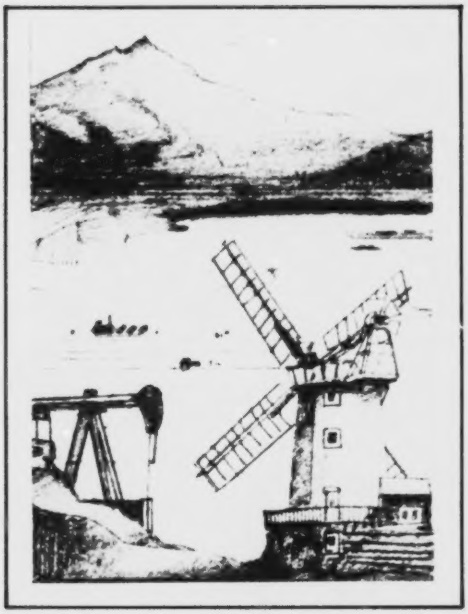
5. Describe the relationship between an increase in the price of electricity and the quantity of electricity consumed.

6. What would probably happen to electricity consumption in general if the price of electricity per kwh decreased:

   a. By 1% b. By 10% c. By 50%

7. Describe the relationship between a decrease in the price of electricity and the quantity of electricity consumed.

Activity 7



RESOURCES FOR ENERGY PRODUCTION

PROGRAM GOAL:

The learner should understand that the amount of energy resources and their availability for human activity vary.

OBJECTIVES:

Students will identify and give examples of the three basic categories of productive resources.
Students will describe how resources are combined to produce electricity.
Students will follow steps in a flow chart of the production of electricity.

KEY VOCABULARY:

Productive resources, natural resources, capital goods, human resources

MATERIALS:

Transparencies:	Natural Resources Capital Goods or Capital Resources Human Resources
Flow Chart:	Electricity Generator Flow Chart. (This can be made on a transparency or drawn on a large piece of butcher paper instead of making a transparency, if the teacher prefers.)
Worksheets:	7A. Productive Resources 7B. Productive Resources for Electricity

RATIONALE:

To meet our wants and needs, a supply of goods and services must be provided. The production of goods and services in turn depends on supplies of basic productive resources. How these resources are combined to produce goods and services in general, and electricity in particular, is the subject of this activity.

IMPLEMENTATION:

1. Begin by reviewing: We know we have certain wants. In order to meet these wants we must somehow produce goods and services. For this production to occur it is necessary to have **productive resoures**. For example, wells and pumps are some of the resources needed for oil production.

2. Worksheets may be used as a guide for students to take notes while you discuss productive resources. Use the transparencies to describe each type of productive resource. Say, "The first type is **natural resources**. Natural resources are the basic building blocks of production, and can't be replaced. Some natural resources are renewable. Examples of renewable resources are water and forests. Others such as oil and coal are used up in the process of production. They are called nonrenewable. **Capital goods** are those things which are used to produce other goods and services. They include machines, tools, and factories. The final resource is called **human resources**. Human resources are the skills, talents, and abilities of people of society. It is very important we understand that these three types of productive resources are necessary for any production to occur."

Answers to Worksheet 7A: (1) resources; (2) natural resources; (3) water, fertile land; (4) water, trees; (5) oil, coal; (6) capital goods; (7) machines, tools, factories; (8) human resources; (9) peoples' skills, talents, abilities; (10) production.

3. Display the large Electricity Flow Chart or Transparency. Review with students briefly how electrical energy is produced. The easiest way to do this is to follow the arrows on the chart.

4. Divide students into groups of three or four people. Have them fill in the worksheet together. When they have completed this task, ask them to add their ideas to the energy flow chart. Compare and discuss answers from each group. Which resources are found naturally in your state for electricity **production**?

5. Have each group "brainstorm" the productive resources needed for one of the following activities:

a. riding a bus
b. airplane trip
c. cab ride
d. car ride with parents

When students have completed their lists, have one group member display their results on the chalkboard.

6. Ask the students the following questions:

a. Which natural resources were needed for each activity? (gasoline, air, jet fuel, iron, steel, etc., materials in vehicle, in roads, airports)

b. Stop and think for a moment. What would happen if the natural resources were more limited and they were no longer available for all of our uses? (Shortages might develop, prices would rise, we would look for alternative resources to use.)

c. Which of these natural resources is least scarce: (Air)

d. What are some ways we can overcome a limited supply? (Rationing, search for alternative resources, use substitute goods or services.)

Answers: Worksheet 7B: Natural Resources-air, water, coal, gas, uranium; Capital resources-generators, electric plants, tools, trucks, etc.; Human resources-engineers, managers, maintenance workers, rate specialists, etc.
Worksheet "Productive Resources": Use lecture information

EVALUATION:

Steps 4-6 in Implementation are good evaluation exercises.

Natural Resources

are the raw materials which
come from the environment.

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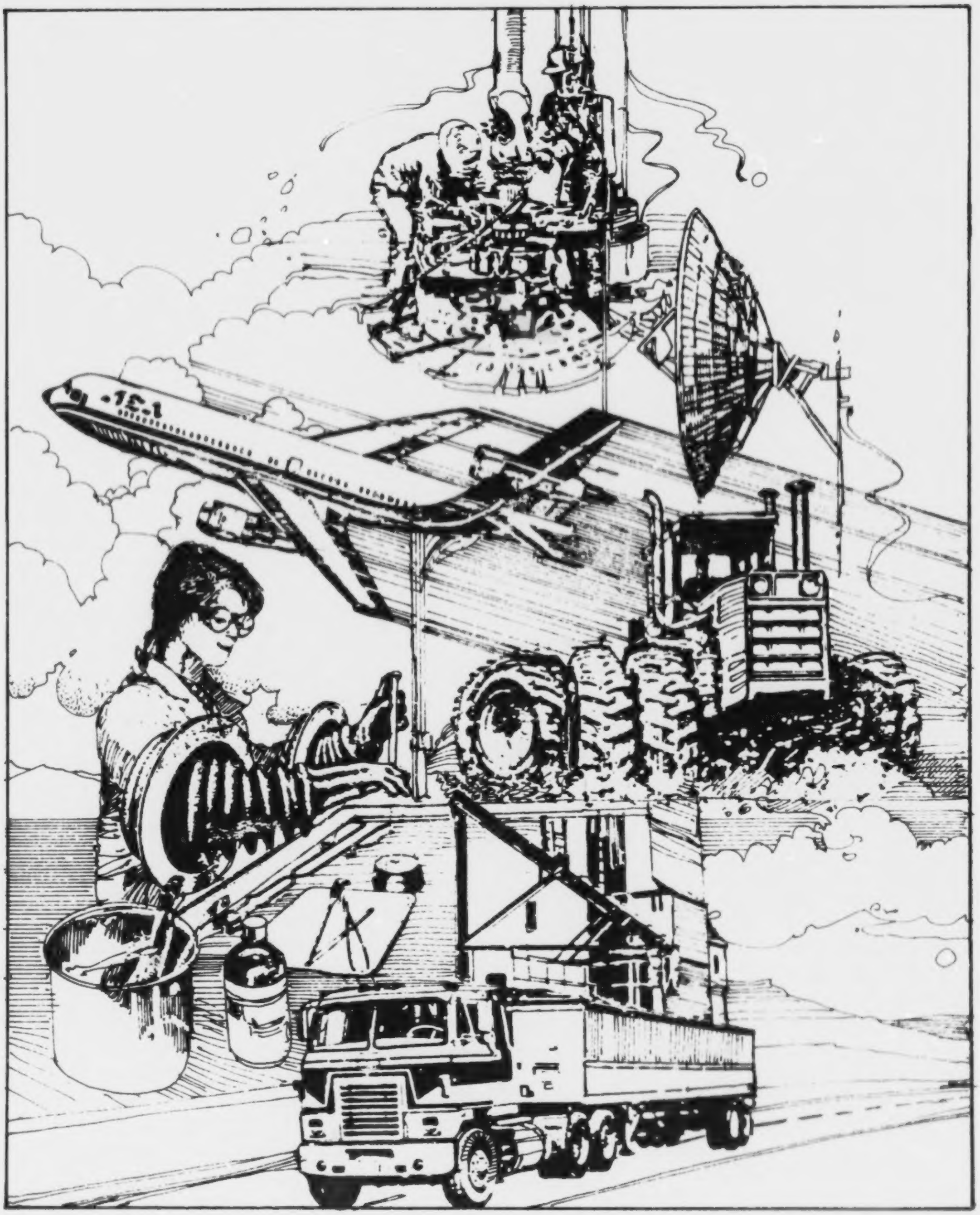

Capital Goods or Capital Resources

are those things created to be used to produce other goods and services. Capital goods such as tools, factories and machinery are a necessity for production.

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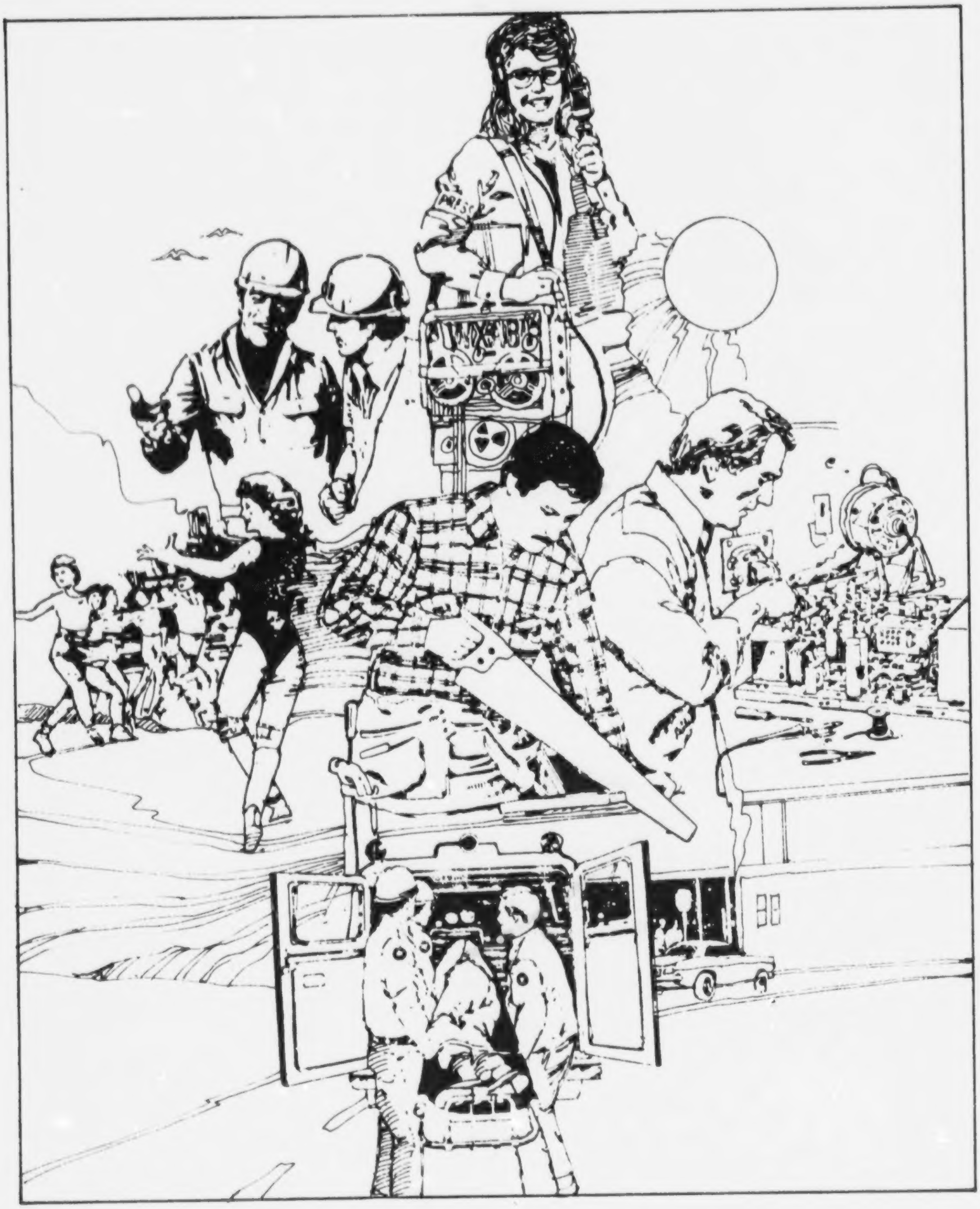

Human Resources

are people and their skills and knowledge.

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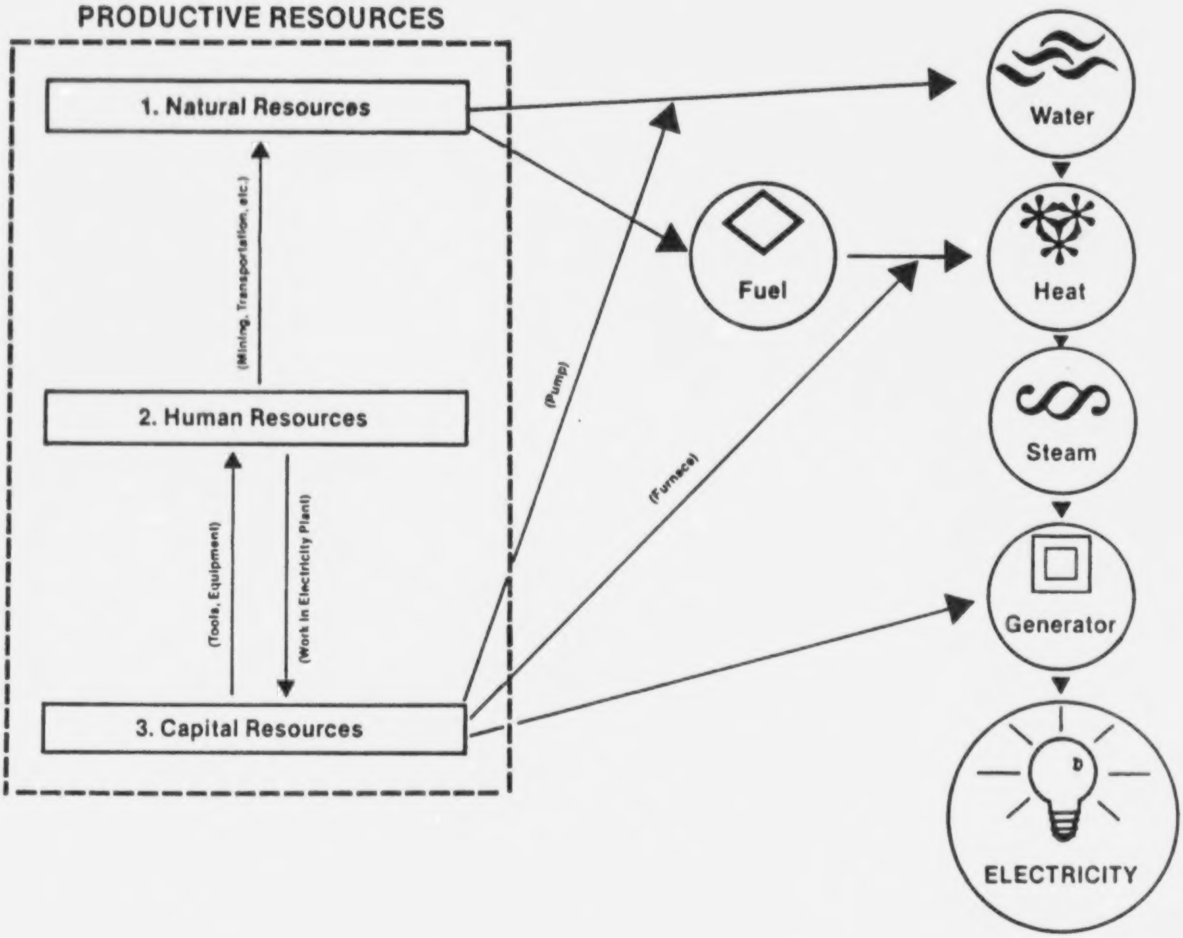
ELECTRICITY GENERATION FLOW CHART



This chart shows some relationships between productive resources and the final product: Electricity. Can you think of other connections not shown here?

Name: ______________________ Date: ______________________

WORKSHEET 7A

PRODUCTIVE RESOURCES

As your teacher explains some important facts on productive resources, fill in the missing words below.

1. For production to occur it is necessary to have ______________________.

2. One productive resource is ______________________.

3. Some natural resources are ______________________.

4. Examples of renewable natural resources are ______________________.

5. Non-renewable or finite resources such as ______________________ are used up in the process of production.

6. Name those things which are used to produce goods and services. ______________________

7. Name some examples of capital goods. ______________________

8. Name the third type of productive resources. ______________________

9. Human resources are ______________________.

10. All three types of productive resources are necessary for ______________________.

64

Name: ______________________________ Date: ______________________________

WORKSHEET 7B

PRODUCTIVE RESOURCES FOR ELECTRICITY

Look carefully at the electricity flow chart. With your group, come up with at least two productive resources from each category below.

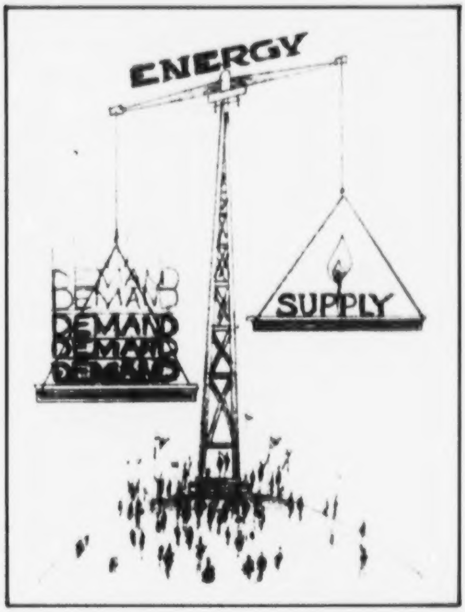
Natural Resources:

Capital Resources:

Human Resources:

Activity 8

ENERGY AND THE LAWS OF DEMAND AND SUPPLY



PROGRAM GOALS:

The learner should understand that the development of energy resources and the use of these resources create impacts on environment and economic systems.

The learner should understand that the amount of energy resources and their availability for human activity vary.

The learner should understand that energy sources, technology, and consumption patterns of the future may be different from those of the past or present.

The learner should understand the value of wise and efficient management practices which extend the useful life of the earth's energy resources.

OBJECTIVES:

Students will define demand, supply, and equilibrium price and quantity.
Students will read and interpret graphs depicting demand and supply curves.
Students will graph demand and supply curves.
Students will analyze the forces causing a shortage or a surplus of a product.

KEY VOCABULARY:

Demand, supply, equilibrium price, quantity, and law of demand

MATERIALS:

Transparencies:	Demand Supply

Worksheets:
8A. Demand & Supply
8B. Law of Demand
8C. Market Equilibrium
8D. Mrs. Sene's Dilemma

RATIONALE:

The quantity buyers wish to purchase at each price is called the **demand** for the product. The quantity sellers wish to offer at each particular price is called the **supply** of the product. In this worksheet/graphing exercise we will see how supply and demand interact to determine market prices.

IMPLEMENTATION:

1. To illustrate a demand schedule and the law of demand, put several possible gasoline prices on the board. For example:

Price/Gallon	Quantity per week
$3.00	
2.00	
1.00	
.50	

Then ask one or more of the students who drive to tell how much gasoline they would purchase per week at each price and put this information in the quantity column. The resulting demand schedule should also illustrate the law of demand, because at a higher price ($3.00) students will generally purchase less gasoline per week than at a lower price ($.50).

a. Define "Demand" and the "Law of Demand." (Demand is a schedule which shows the various amounts of a product which consumers are willing and able to purchase at each specified price in a set of possible prices during some specified period of time. The so-called Law of Demand is that there is an inverse relationship between price and quantity demanded. As price falls, the corresponding quantity demanded will increase; as price rises, the corresponding quantity demanded will decrease.)

b. Discuss the assumptions which are made in talking about Demand and the Law of Demand. (That is, we assume that all factors remain unchanged, except price during the time period.)

c. What are some of these factors which could change the demand schedule? (Changes income, tastes, price of related goods (substitutes or complements).)

d. Discuss how changes in these factors would affect demand schedule. (Examples: Increased income would increase quantity demanded at each price; small cars replacing large would decrease gasoline quantity demanded at every price; falling price of gasoline substitutes would mean more substitutes and less gasoline demanded at each price)

Choose an item that is commonly purchased by senior high school students (such as gasoline) and select several prices for that item ranging from very low to outrageously high. Put these prices on the board and ask the quantity that students would purchase at each particular price. Put these quantities beside each price. This represents a hypothetical demand schedule for that item. You should find that a smaller quantity is purchased at the higher prices. This inverse relationship between price and quantity bought is called the Law of Demand. Demonstrate this to the students by looking at the nominal results (price and quantity). Then graph results, with price on the vertical axis and quantity on horizontal axis.

2. a. Show transparency illustrating the "law" of demand.

b. Then show transparency illustrating supply and discuss relationship between quantity supplied and price. Have students answer the questions on Worksheet 8A, "Demand & Supply."

c. Now put the transparency showing "demand" on top of the "supply" transparency. At what price is the amount demanded the same as the amount supplied? (About $2.50) What is the quantity? (About 2,500) These are called the equilibrium price and quantity.

d.. At a price above the equilibrium price there will be a surplus (quantity supplied exceeds quantity demanded). For example, at a price of $4.00 the quantity supplied is 4000 units and the quantity demanded is 1000 units.

e. At a price below the equilibrium price there will be a shortage (quantity demanded exceeds the quantity supplied). For example at $1.00 the quantity demanded is 4000 units and the quantity supplied is 1000 units.

3. Distribute worksheet on the Law of Demand. Complete these in class, but keep them for the next lesson on supply.

Answers to Worksheet 8B--Law of Demand questions:
(2) quantity, price
(3) inverse
(4) tastes, income, prices of substitutes
(5) more, right
(6) less

4. Distribute Worksheet 8C "Market Equilibrium." Have students complete it in class. Discuss the answers.

Answers:

(1) and (2) intersect at $18 and 2600

(3) Prices below $18 cause shortages, above $18 cause surpluses
(4) Surplus, shortage
(5) lower, to $18
(6) rise, some buyers want to pay more and bid prices up, this means sellers will supply some more until equilibrium is reached
(7) Buyers demand 4300 but sellers are only willing to supply 1300 each, illegal "black market" sales above legal
(8) Rationing tickets, first come-first served, restrict amount sold to price, sell by license number on different days, etc.
(9) Both rise
(10) price rises, quantity falls

(11) price falls, quantity rises

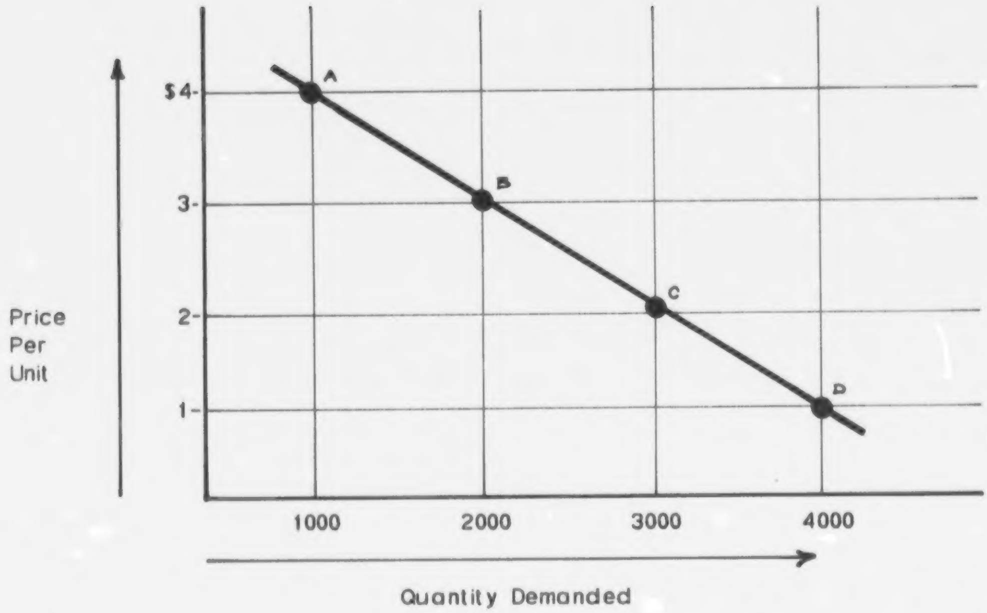
EVALUATION:

Discuss Worksheet 8D--Mrs. Sene's Dilemma--with correct answers. Brainstorm on solutions to Mrs. Sene's dilemma.

Answers: (a) 400; (b) 400; (c) supplied; (d) $10; (e) $400; (f) 360; (g) 40; (h) equilibrium; (i) 550; (j) shortage; (k) equilibrium; (l) eight; (m) shortage.

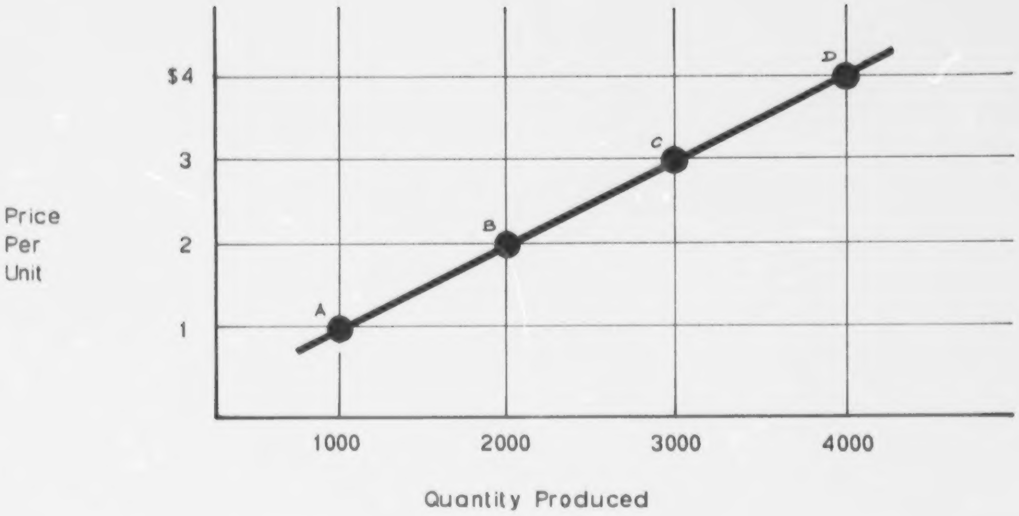
Some possible solutions: (a) Rationing- might lose customers but everyone could have some gasoline; (b) Buy extra gasoline from high-cost suppliers and try to cut costs elsewhere; (c) Serve customers on a first-come, first-served basis- same disadvantages as rationing without the advantage; (d) Buy higher priced extra gasoline at a loss, but hope that competitors will raise prices soon- this would be good only if you are sure that other stations are also losing and will need to raise prices soon. (She can't stay in business for long without a profit.)

DEMAND



Demand is the willingness and the ability of consumers to spend money for goods and/or services. For most things in a given time period, the higher the price, the smaller the quantity that will be demanded. (Or the lower the price, the greater the quantity that will be demanded.) This **inverse** relationship between prices and quantities demanded is called "the law of demand." Notice that the graph of this relationship is a downward sloping demand curve.

SUPPLY



Supply is the amount of goods available for purchase to consumers. Two factors determine the supply: (1) cost of production and (2) the selling price. Generally, the higher the price, the larger the quantity that producers will be willing and able to supply. This is called the "law of supply."

If cost of production rises, the supply will decrease (curve shifts left) because producers won't find it profitable to produce the same amounts at the original prices. They will require a higher price to produce at each original quantity.

Name:____________________________ Date:____________________________

WORKSHEET 8A

DEMAND & SUPPLY

DEMAND

Look at the Demand Graph and answer the following:
How much is demanded at $4? at $2?
How much are people willing and able to pay to purchase 4,000 units?
As price of this product rises, consumers will buy more or less?

An increase in demand means people will buy more at each price. The new demand curve would be to the right of the original. (For example, people might buy 2,000 at $4, 3,000 at $3, 4,000 at $2 and 5,000 at $1.)

A decrease in demand means people will buy less at each price. This would be illustrated by a demand curve to the left of the original. (For example, people might buy 0 at $4, 1,000 at $3, 2,000 at $2, 3,000 at $1.)

Therefore, an increase or decrease in demand means that the original demand curve has shifted. Such a change in demand means there is a new demand schedule.

SUPPLY

Look at the Supply Graph and answer the following:
How much will be supplied at $4? at $1?
What price will producers require to offer 3,000 units?
As price of this product rises, producers will supply more or less?

An increase in supply means producers will supply more at each price. The new supply curve would be to the right of the original. (For example, producers might supply 2,000 units at $1, 3000 units at $2, 4,000 units at $3, and 5000 units at $5.)

A decrease in supply means producers will supply less at each price. The new supply curve would be to the left of the original. (For example, producers might supply units at $1, 1000 units at $2, 2,000 units at $3, and 3,000 units at $4.)

Therefore, an increase or decrease in supply means that the supply curve has shifted. Such a change in supply means there is a new supply curve.

Name: ______________________________ Date: ______________________________

WORKSHEET 8B

LAW OF DEMAND

1. Construct a demand curve from the following demand schedule for oil.

Price Per Barrel	Barrels Demanded Per Week
$36	100
32	300
28	700
24	1,000
20	2,100
16	3,100
12	4,300
8	5,700
4	7,300
1	9,100

Fill in the blank with the correct words from the list below.

2. Demand is a schedule which tells the _______ of something that people are willing and able to purchase at each specific _______ during a specific time period.

3. This curve illustrates the "Law of Demand" which states that there is a(n) _______ relationship between price and quantity demanded.

4. Changes in this demand curve could be caused by changes in _______, ________, or _______.

5. An increase in income would probably increase demand. This means _______ would be bought at every price. The new curve would be to the _______ of the original.

6. From the Law of Demand, we can conclude that higher prices generally cause us to demand _______ of a product.

Words to use

quantity
direct
tastes
inverse
right
left
price
incomes
prices of substitutes
less
more

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Name:__________________________ Date: __________________________

WORKSHEET 8C

MARKET EQUILIBRIUM

Earlier we had a worksheet about demand using oil and oil prices as the example. In this worksheet we will continue with the oil example and show how product demand and supply are related.

1. Using the supply schedule below, construct a supply curve using the price-quantity measures on your demand worksheet.

Oil Supply Schedule

Price per Barrel	Barrels Supplied Per Week
$ 1	100
4	300
8	700
12	1,300
16	2,100
20	3,100
24	4,300
28	5,700
32	7,200
36	9,100

On your graph there are now two curves: a supply curve and a demand curve. The upward or positive slope of the supply curve indicates a direct relationship between price and quantity supplied. The downward or negative slope of the demand curve indicates an inverse relationship between price and quantity demanded. (Remember the Law of Demand?)

2. Find the intersection point of the supply and demand curves. What price does this represent? $____________ What quantity?__________ (approximate)

Notice that this is the only price where quantity demanded is the same as the quantity supplied. This is called the market equilibrium price and quantity.

3. Look at your graph or the demand and supply schedules to tell whether there will be a "surplus" or "shortage" at each of these prices. The first one is done for you.

Price	Surplus or Shortage	How many barrels
$1	Shortage	9000 (9100-100)
4		
8		
12		
16		
18	Equilibrium	zero
20		
24		
28		
32		
36		

4. When prices rise above equilibrium, there will be a ________(surplus or shortage). When prices fall below equilibrium, there will be a _______(surplus or shortage).

5. Assume that in a market system buyers compete with each other to get the products they need and that producers compete with each other to sell what they produce. No one controls the prices. In this example, would you expect producers to raise or lower prices if the beginning price was $24 and a surplus existed?
Where would the price probably settle? $_______.

6. If there was a shortage, would you expect the price to rise or fall? Why?

7. Imagine that most consumers in this example felt that the equilibrium price was unfair and too high. Congress decided to pass a law which did not allow the price per barrel to rise above $12. Now since price is controlled below the equilibrium, will there be a shortage?

8. Over a decade ago, when gasoline prices were controlled, shortages did occur. What are some possible ways to deal with this problem? Are any of these better than allowing prices to rise to very high levels?

9. Suppose incomes rise, and everyone is willing to buy more oil at each price. Earlier we saw this caused the demand curve to shift right. That is, demand increase. What will happen to the equilibrium price and quantity when demand increases?

10. Suppose oil producers decided to cut back the supply and offer less at each price. The supply curve shifts left. What will happen to equilibrium price and quantity when supply decreases?

11. Suppose oil producers increase the supply of oil and offer more at each price. The supply curve shifts right. What will happen to equilibrium price and quantity when supply increases?

WORKSHEET 8D

Name:________________________ Date:________________________

Instructions: As you read the story fill in the number of the appropriate answer from the list below.

Mrs. Sene's Dilemma

Mrs. Kero Sene owns a gasoline station. She regularly receives 400 gallons of gasoline each week from her distributor. At the existing price of $1.00 per gallon her 40 regular customers each bought 10 gallons per week. Therefore, at this price the weekly quantity demanded for gasoline at Kero's was (a)________ gallons each week. As you have seen, her weekly quantity supplied was (b)________ gallons. Everybody was satisfied since the quantity demanded was equal to the quantity (c)_____.

When the quantity of demand and supply are equal, this point is called an equilibrium quantity and equilibrium price.

Kero had been charging $1.00 per gallon of gasoline, about the same as other stations in town. Therefore regular customers spent an average of (d)_____ each per week, and Kero received revenue of (e)______.

Then one day another nearby station lowered its gasoline price by 2 cents a gallon. Kero lost four regular customers. The quantity demanded for kero's gasoline was now only (f)_____ gallons per week and there were (g)_____ gallons left over. This extra amount is called a surplus. Since the quantity supplied is now more than that demanded for Kero's gasoline, $1.00 is no longer the (h)_____price.

In order to get her customers back, Kero lowered her price to 97 cents per gallon. Her customers returned but so did ten new customers and her loyal customers all decided they would drive more. Now each customer averaged 11 gallons per week in purchases. With 50 customers, this brought total quantity demanded for Kero's gas to (i)_____ gallons per week. Now Mrs. Kero had a (j)______ of gasoline. There was still no (k) _____ price.

In order to increase her quantity of supply, Kero would have to pay a lot more to bring gasoline from a distant distributor. She could not afford this but she did not want to leave some of her customers without gasoline. She believed she had two choices: to ration gasoline by limiting each of the 50 customers to (l)_____ gallons per week or to raise the price to 98, the price that the other stations now charged.

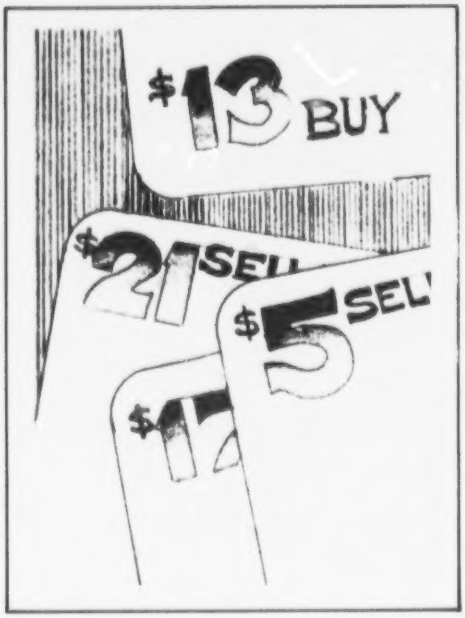
She decided that rationing may make some customers angry so she raised the price to 98 cents. Her new customers went elsewhere then and she had the original 40 customers again. However, they were buying slightly more than the 10 gallon average that they bought at the $1.00 price. There was still a (m)_____. What are the possible solutions to Kero's problem? Discuss advantages and disadvantages of each.

Possible Answers (Some may be used more than once or not at all)

1. shortage
2. supplied
3. 400
4. $400
5. 550
6. more
7. demanded
8. $10,000
9. 360
10. equilibrium
11. less
12. eight
13. $10
14. 40

Activity 9

COMPETITIVE MARKETS AND CARTEL POWER



PROGRAM GOAL:

The learner should understand that energy sources, technology, and consumption patterns of the future may be different from those of the past or present.

OBJECTIVES:

Students will describe the effects that different market conditions have on price.
Students will participate in a market which simulates the pressures that cartel members face to lower their prices.

KEY VOCABULARY:

Competitive market, cartel

MATERIALS:

32 SELL cards
32 BUY cards

RATIONALE:

The world market for oil has not been competitive for most of its history. In this simulation students will observe the different price effects between a competitive market and one dominated by a cartel.

IMPLEMENTATION:

Use the "Oil Price Game" simulation for students to experience transactions occurring in both competitive and cartel-like markets.

The Oil Price Game--Everybody plays

Divide the class into two groups. Distribute one set of cards to the Oil Consuming nations; a different set of cards to the Oil Producing nations. Tie white arm bands on the Oil Producers and use another color tie for the Oil Consumers, or use some other identifying symbols.
Allow plenty of time for students to get a notion of the game and learn the procedures.
Anticipate some difficulty with learning how transactions are made and prices reported.

Part 1:
Play begins with the distribution of BUY and SELL cards. (It will help speed up the game if you match the color of the card to the arm band color.) Cards suitable for copying are on last page of his activity.

Insert price per barrel on each BUY card and insert price per barrel on each SELL according to this distribution.

Price	# of cards	Price	# of cards
$21.00	4	$19.00	2
19.00	4	17.00	2
17.00	4	15.00	2
15.00	4	13.00	2
13.00	4	11.00	4
11.00	4	9.00	4
9.00	4	7.00	6
7.00	4	5.00	6
5.00	5	3.00	4
3.00	4		

A complete set of Buyer and Seller cards should be used whenever the game is played with a class of more than 32 students. While the game is played, the cards should be kept in separate stacks on a desk near where the recorder is tallying the prices. As cards are turned in, students should take a different buy or sell order, according to their roles. Individual cards may be used more than once in the game, but make sure students don't keep cards for more than one transaction. If a student is unable to complete a transaction within five minutes, a new card may be given out to replace the old instructions.

Have students keep a record of their individual "profits." Buyers' profit is difference between purchase price and price on cards. Sellers' profit is difference between sale price and price on card. Tell students to maximize profits if they can.

Record the price on the board where students can see the price at which oil is being sold. One way to show the tendency of prices to reach some "equilibrium" level is to record prices by time period. The following table could be used to record this information on the board.

Price	Five Minutes of Play	Second Five Minutes of Play	Third Five Minutes of Play
$21			
20			
19			
18			
17			
16			
15			
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			

Prices at left list the possible prices at which oil could be sold in the game. As students report each transaction, make a mark beside the price reported.
Separate transactions made during the first five minutes from those in other time frames. Transactions tend to move toward the equilibrium as time passes, mainly because more buyers and sellers become aware of the price of oil.

Debrief: After 15 minutes, or sooner if the price has stabilized, declare the market closed, collect all outstanding cards, and ask the students to analyze what happened. Address the following questions:

1. Economists often talk about the supply and demand for a certain product. Who demanded oil in the game? (The Buyers; the Oil Consuming nations.)

2. Who were the suppliers? (The Sellers; the Oil Producing nations.)

3. At the beginning of the game, what was the range, the highest and the lowest prices at which oil sold? Was the price range as wide during the succeeding five-minute periods? Why or why not? (Most simulations start off with the maximum range, from $3 to $21, with transactions moving toward the theoretical equilibrium of $11, by the end of the game. Don't expect $11 as the only price at the game's end. Prices will nearly always vary, but with each round the variances will lessen.

4. By the end of the game, what price do you think would have been acceptable to the majority of Buyers and Sellers? Why? (Answers will vary. Usually students will see that a price becomes acceptable when it is not violating the majority of Buyers and Sellers instructions, and when it still allows some profit to both parties.)

5. What happened when a seller tried to sell at a price higher than the acceptable price? Did the same thing happen when a buyer tried to buy at a price lower than the acceptable one? (Students should suggest that the price above or below this acceptable price would be impossible for most participants to meet.)

6. How does the market for oil differ from the real world market? (Much of the oil sold in the world market is controlled by OPEC. This organization of petroleum exporting nations determines the supply and price of oil. There is no competitive market for the international sale of oil.)

Part II:

The first part of the simulation created a world market for oil, but it was unlike the real market because it contained perfect competition among both buyers and sellers. In the past the world market for oil has been dominated by an organization called OPEC whose members are major oil exporting countries. When sellers organize to control production and prices, that organization is called a cartel. OPEC is a cartel.

To simulate a cartel, tell Sellers that they must agree upon a price before beginning any bargaining. They must not change this price during the bargaining session.

Allow enough time for the oil producers to determine the oil price. After the "cartel" has decided on a price, distribute buy cards to the rest of the class. These students should be instructed to buy oil at the lowest price possible, and yet not violate their instructions. Record the transactions as before. You should anticipate two outcomes:

1. Students in the "cartel" will stay with their fixed price, thus making it impossible for some buyers to purchase oil. Frustration will bring the game to an end quickly, with only a few students being able to make transactions.

2. Some "cartel" members will be unable to maintain their fixed prices because of pressure imposed by the frustrated buyers. If this happens, keep the game going until the fixed price is either reestablished or dissolves entirely.

Debrief: At the end of the simulation, have students review what happened. Use the following questions to help guide the thinking:

a. How was the price of oil determined in this game? (The cartel members agreed beforehand on the price. They tried to maintain this price despite pressure from their buyers.)

b. How did the outcome differ from the first one? (Probable answers: difference in final price; cartel produced a higher price.)

c. Why might some cartel members break a price agreement? (Some nations might think they could make more money by selling more oil at a lower price, pressure from buyers, a distrust of other cartel members also might influence decisions.)

d. What factors help a cartel maintain a fixed price? (A cartel is most likely to be successful if the members have similar political or ideological ties.)

e. Of the two types of world oil markets, which is better for consuming nations? Why? (The competitive market. In an open market, prices are lower and quantity produced is greater than in a controlled market.)

f. Which is probably better for producing nations--the cartel or competitive market? (Probably the cartel, since the profits are generally greater.)

g. How can a rise in world oil prices affect production of oil in the United States? (A higher world price might make it profitable to develop new oil wells or seek alternative sources of energy. These activities would increase production of energy in the United States.)

h. What might happen if the price of oil quadrupled? (Perhaps world-wide economic depression. This, of course, could reduce the demand for oil to a point where oil prices might drop again.)

Part III:

The power of the OPEC cartel has been weakened in recent years. Other countries (e.g. Mexico, Britian, etc.) have made discoveries and increased production. These events have increased the supply of oil. Also, the demand for oil has decreased because of energy conservation and new technology.

To simulate these events, return to the original conditions in Part I where half the class were buyers and half the class were sellers. Then cut the number of buyers in half and make one of the two buyer groups sellers. Thus, three-fourths of the class will be sellers and one-fourth will be buyers.

Have the students play the game for a round. At the end of the round, have students review what happened.

a. What happened to the price? (the price should have fallen)

b. Why did the price fall? (supply increased; demand decreased)

The Oil Price Game is adapted from **Energy in the Global Marketplace**, Oak Ridge, TN: U.S. Department of Energy, 1978, pp. 39-45, 69.

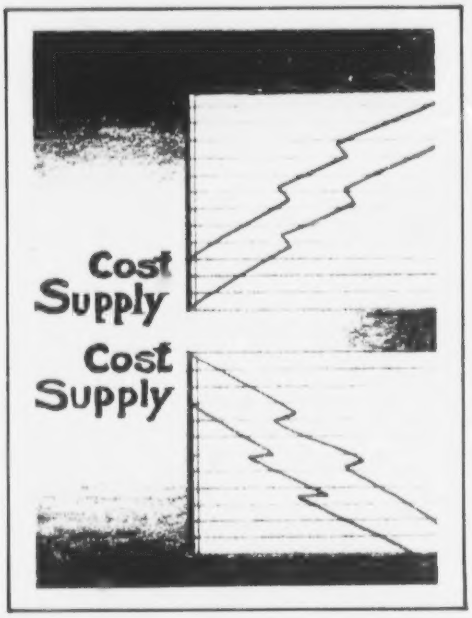
EVALUATION:

Discuss questions included with game instructions.

BUY CARDS	SELL CARDS
Buy 1,000 barrels of oil for not more than $________ per barrel. Try to get the price you can below this price. Do not buy oil above this price unless you decide to take a loss. If you haven't bought any oil after 5 minutes, get another buy order.	Sell 1,000 barrels of oil for not less than $________ per barrel. Try to get the price you can above this price. Do not sell oil below this price unless you decide to take a loss. If you haven't sold any oil after 5 minutes, get another sell order.
Buy 1,000 barrels of oil for not more than $________ per barrel. Try to get the price you can below this price. Do not buy oil above this price unless you decide to take a loss. If you haven't bought any oil after 5 minutes, get another buy order.	Sell 1,000 barrels of oil for not less than $________ per barrel. Try to get the price you can above this price. Do not sell oil below this price unless you decide to take a loss. If you haven't sold any oil after 5 minutes, get another sell order.
Buy 1,000 barrels of oil for not more than $________ per barrel. Try to get the price you can below this price. Do not buy oil above this price unless you decide to take a loss. If you haven't bought any oil after 5 minutes, get another buy order.	Sell 1,000 barrels of oil for not less than $________ per barrel. Try to get the price you can above this price. Do not sell oil below this price unless you decide to take a loss. If you haven't sold any oil after 5 minutes, get another sell order.
Buy 1,000 barrels of oil for not more than $________ per barrel. Try to get the price you can below this price. Do not buy oil above this price unless you decide to take a loss. If you haven't bought any oil after 5 minutes, get another buy order.	Sell 1,000 barrels of oil for not less than $________ per barrel. Try to get the price you can above this price. Do not sell oil below this price unless you decide to take a loss. If you haven't sold any oil after 5 minutes, get another sell order.

Activity 10

SUPPLYING ENERGY RESOURCES



PROGRAM GOALS:

The learner should understand that the amount of energy resources and their availability for human activity vary.

OBJECTIVES:

Students will observe that remaining fossil fuel reserves are unknown.

Students will predict that as fuels become more difficult to find, the cost of energy will rise.

Students will infer that as prices for energy rise, there is incentive for producers to explore and produce new energy sources.

KEY VOCABULARY:

Law of Supply

MATERIALS:

A large handful of very small beads, at least four different colors, mixed with an equal quantity of cornmeal in a small canister, such as a container for 35mm film. The percentages of bead colors to be placed in the canister are suggested in number 3.

RATIONALE:

In another lesson we examined types of productive resources. In this activity we analyze some of the other factors affecting supply.

IMPLEMENTATION:

Activity Instructions:

1. This activity illustrates some of the existing dilemmas in obtaining energy supplies.
2. Before students arrive in class, throw the handful of beads high in the air, hitting the ceiling. Divide the class into five companies.
3. Each company will search for one color bead. The total number of beads should be broken down in the following proportions.

Company I -- black (coal) 50%
Company II -- red (uranium) 3%
Company III -- white (natural gas) 10%
Company IV -- blue (oil) 37%
Company V -- cornmeal (solar) heaping tablespoon

NOTE TO TEACHERS: (If any company starts to gather all colors, do not interfere or comment.)

4. Explain that you have thrown an unknown quantity of beads, energy resources, on the classroom floor. The total resources available represent those available in 1957.
5. The first search will last one (1) minute.
6. Start the search.
7. Stop in one minute.
8. Have each company count its resources.
9. Keep the resources (beads) in separate piles. Record the totals for each group for each round on the blackboard.
10. Start a second search for one more minute. Each company must search for resources still missing. Record totals.
11. Start a third and final one minute round. Search and record totals.

At the end of this activity, the teacher will ask for clean-up volunteers. See how responses would change as you offer various prices for each bead collected.

This game is from **Energy Tradeoffs in the Marketplace**, prepared by Washington State Superintendent of Public Instruction Office and Washington State Council on Economic Education, (Seattle, WA; 1980) pp. 51-55.

EVALUATION:

Discuss the following questions:

1. Which energy sources were easiest to collect? Why? Which were most difficult? Why?

Answer: Probably coal and oil are the easiest to collect because they were most abundant; most difficult to collect would be uranium and solar.

What makes them easy or difficult to find? Is it the availability of the beads or is it the skill of the searchers?

Answer: Both availability and skill are important.

NOTE TO THE TEACHER: Cornmeal (solar) is diffuse and hard to gather. (The gathering and conversion represents a high cost in terms of land, labor or capital. Until technology reduces costs, i.e. land, labor or capital, it will not be widely used.)

2. Looking at the piles of energy, what generalizations can you make?
Answer: The third pile may be smaller than the previous piles because the beads are harder to find and people may not have looked as hard.

3. Did anyone collect more than one energy resource? Is it realistic to collect more than one? Explain.
Answer: Yes--it is realistic--companies will gather the most accessible source of energy--i.e. oil companies often mine coal.

4. What economic resources were used to gather the energy beads?
Answer: Labor resources primarily; capital if a tool was used.

5. What do we know about the number of beads that were left on the floor?
Answer: Only that there are fewer beads available now than when the group first started to search for them.

6. What is the supply of energy?
Answer: It is not all of the beads thrown on the floor. Instead it is the beads on the table and whatever additional beads students can find in the near future if they think they can receive a good price for what they have found so far.

7. How might we have found more beads in the same time period?
Answer: A broom or vacuum cleaner could be used, or everyone could look for all colors.

8. What is the opportunity cost of obtaining a vacuum cleaner or broom during the search period?
Answer: The opportunity cost is any beads that must be foregone while you are looking for a vacuum cleaner.

9. As energy becomes more scarce and demand continues to increase, what should happen to prices?
Answer: Prices should rise.

10. Did you change the room's environment as you looked for beads?
Answer: If the furniture has been disturbed, this would represent environmental costs.

11. Identify a number of examples of social benefits and social costs associated with the production of energy.
Answer: Social costs - strip mining, oil wells, oil spills, etc. Social benefits - air conditioned buildings, improved transportation, etc.

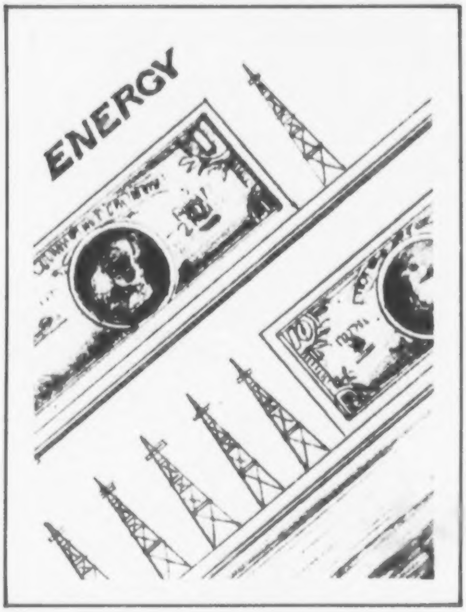
12. Ask for student volunteers to help clean up the room. Then ask how many students would help if you paid them a penny a bead. Increase the amount that you offer per bead to 5 cents, 10 cents, 25 cents per bead until you can entice the entire

class into helping you. Then relate their response to the "Law of Supply" which indicates that increased price will call out larger supply.

13. Note that this direct relationship between quantity supplied and price is known as the "Law of Supply."

Activity 11

PROFITS AND INCENTIVES IN ENERGY MARKETS



PROGRAM GOAL:

The learner should understand that the amount of energy resources and their availability for human activity vary.

OBJECTIVES:

Students will define profits, profit motive, gross sales, depreciation, fringe benefits, total costs of production.
Students will identify the role that profits play in our economic system.
Students will construct a hypothesis about the relationship between oil prices, profits, and drilling activity, and relate this to the Law of Supply.

KEY VOCABULARY:

Profits, profit motive, gross sales, depreciation, fringe benefits, total costs of production

MATERIALS:

Worksheets: 11A. The Profit Motive
11B. Oil Prices and Drilling Activity

RATIONALE:

The profit motive may be the most important factor in directing business activity in our market system because businesses will produce goods and services that they expect will earn a profit. Profits are also retained by businesses as an important source of funds for future investment and growth. Understanding the role of profits is essential to understanding energy production in our economy.

IMPLEMENTATION:

1. Have students define bold print words on worksheet--The Profit Motive. This could be done orally with the aid of a dictionary. (Gross sales= total sales revenue before subtracting costs or taxes; fringe benefits= addition to wage costs like insurance benefits, vacation pay, etc.; depreciation= estimated cost of machinery, plant and equipment deterioration; profit= gross sales (total revenue) minus total costs.)

2. Distribute and explain how to do worksheet problems using above concepts.

3. Worksheet--Oil Prices and Drilling Activity illustrates the relationship between price and investment in oil well drilling. The implication of rapidly rising prices (assuming costs stay the same or rise less rapidly) is that profits will increase. The expected increase in profits provides incentive for more exploration (drilling) and in turn, more oil production.

EVALUATION:

Correct answers to worksheets. Discuss these in class, especially "Oil Prices and Drilling Activity.

Answers to Worksheet 11A, The Profit Motive: 1) $150,000 2) more than profits 3) a. $96,000 b. 30,000 c. 23,000 d. 7,000 + 20,000 + 16,000 = 43,000 4) $96,000 5) $54,000 6) No, because gasoline is a cheaper substitute unless miracle fuel provided more miles per dollar. 7) Not to produce 8) Profits determined by price of miracle and its substitutes as well as costs.

Answers to Worksheet 11B, Oil Prices and Drilling Activity: 1) Prices rose rapidly due to Arab and later Iran's oil embargo and government de-control of prices. (Oil prices were kept low by policy in early 1970's - both our government and OPEC countries had some controls.) 2) They would rise 3) 1973-1981, grew, because companies expected more profits with higher prices. Also high prices made it easier to afford to drill in new places. 1982-1984, fell, because lower profits expected with lower prices. 4) Graph should slope up from left to right.

Name: ______________________ Date: ______________________

WORKSHEET 11A

The Profit Motive

Suppose you invented a miracle fuel that could be used as a substitute for gasoline in any present automobile. In order to produce it, you purchased some expensive equipment, and you borrowed $100,000 for this equipment to get your new business started.

During the year, the firm sold 150,000 gallons of fuel to a retailer for $1.00 per gallon.

1. What were the gross sales for the firm?

2. Are the gross sales the same as profits or more or less?

3. Your actual production costs for fuel for one year were:

Salaries and fringe benefits	$30,000
Building rent	7,000
Equipment depreciation	20,000
Utilities	3,000
Raw materials for fuel	20,000
Interest on loan	16,000

  a. What are the total costs of production?
  b. How much is spent on human resources (labor)?
  c. On natural resources (raw materials)?
  d. On capital goods?

4. To make a profit you must have sales that are more than $______________.

5. What are the profits in this example?

6. Suppose the price of gasoline was $.75 per gallon. Do you think you could sell any miracle fuel at $1.00 a gallon?
Why or why not?

7. What would you decide about production of miracle fuel if the government told you that no one could charge more than $.50 per gallon?

Explain why you would make this decision.

8. What seems to determine whether or not you make the decision to produce miracle fuel?

89

Name: ______________________ Date: ______________________

WORKSHEET 11B

Oil Prices and Drilling Activity

Below is a table and a graph with some information about oil prices and oil wells drilled in the United States from 1973 to 1981. Use this information to answer the questions below.

Oil Prices and Drilling Activity		
Year	Average Real Price of Crude Oil per barrel (Dollars)	Oil Wells Drilled (Excludes Dry Holes)
1975	8.00	16,000
1976	8.00	17,000
1977	9.00	19,000
1978	9.00	18,000
1979	13.00	19,000
1980	22.00	27,000
1981	32.00	35,000
1982	29.00	36,000
1983	26.00	33,000
1984	26.00	29,000

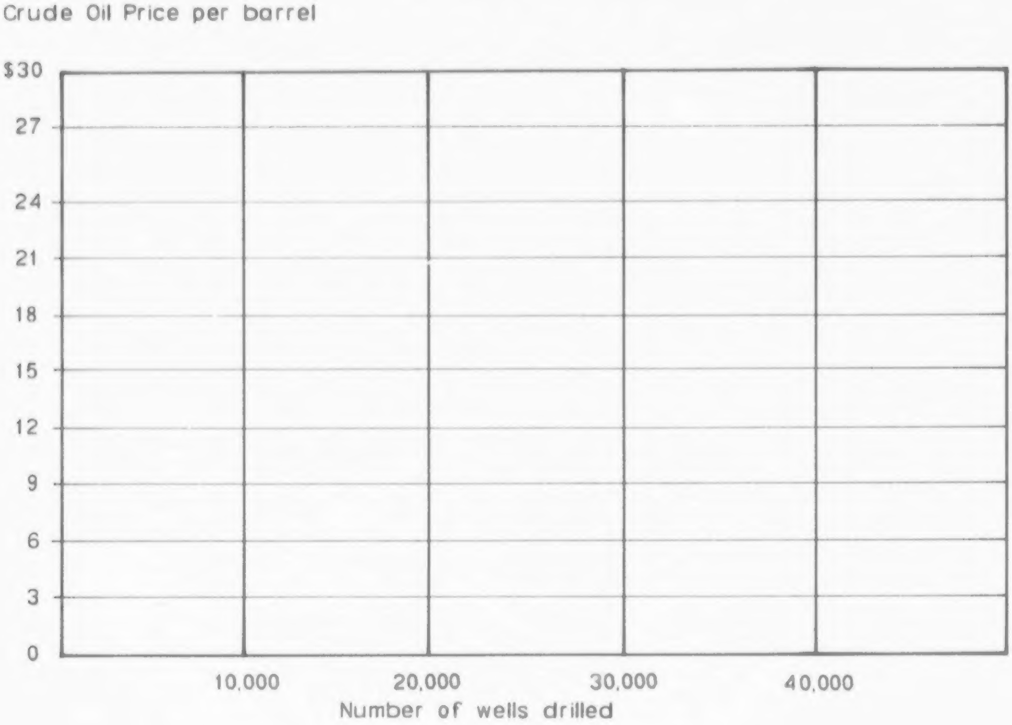
Statistical Abstract of the United States--1986, Tables 1215 and 1226.

1. What happened to oil prices over this period?

2. When prices rose as rapidly as they did during 1973-1981, what do you suppose happened to oil companies' profits? (Assume that production costs stayed the same or rose less rapidly.)

3. What happened, in general, to the number of new oil wells drilled each year from 1973-1981? Why do you think this occurred? Then what happened to the number of wells drilled each year from 1982 to 1984? Why did this occur?

4. Make a graph showing this information measuring price and number of wells drilled as shown. (Round prices to the nearest dollar, number of wells to nearest hundred.)



Remember Activity 8 on Supply and Demand? The graph you have drawn illustrates an important concept called "The Law of Supply." It states that the quantity supplied will rise when prices rise. Here we see the number of wells rising as oil prices rise. More wells will enable more production and an increase in the quantity of oil supplied.

Activity 12

PROFITS IN THE OIL INDUSTRY

PROGRAM GOALS:

The learner should understand that the development of energy resource and the use of these resources create impacts on environmental and economic systems.

The learner should understand that the amount of energy resources and their availability for human activity vary.

OBJECTIVES:

Students will define net profits, stockholders' equity, return on sales, return on equity.
Students will read financial tables giving data on above items.
Students will identify the role of profits in a market economic system and identify possible sources of profits.

KEY VOCABULARY:

Net profits, stockholders' equity, return on sales, return on equity, and market economic system.

MATERIALS:

Handouts:	Definitions Profit Information Sheet --Table 1 Profit Information Sheet --Table 2
Worksheet:	12A Profits

RATIONALE:

The billions of dollars in oil company profits have often made headlines. What are profits? What is their role in our economic system? How should we view a company's profits? These are important questions to ponder in economics.

IMPLEMENTATION:

Distribute information sheet with definitions, tables, and worksheets. Students will complete worksheets using this information.

EVALUATION:

Correct worksheets and discuss. It is important for students to put profits in perspective compared with sales and equity. The absolute dollar figures alone don't mean much.

Answers to Worksheet 12A, Profits:

1. a. Exxon
b. Exxon
c. Exxon
d. Fall, 1982 was a recession year (declining demand).
e. Stayed about the same. Economic conditions stayed the same.

2. a. Mining, crude oil production
b. Mining in 1980, food, clothing in 1982
c. Petroleum in 1980, food in the other years
d. Motor vehicles

3. Reward for risk-taking, new inventions

4. New supply sources and declining demand caused lower prices; costs were probably also higher. National economic conditions can also influence profit. 1982 profits were affected by the recession.

5. Profits encourage risk-taking, new inventions, innovation, efficient business operation and are a source of investment funds.

6. Not necessarily. It may be in certain years, but it does not appear to be over time.

HANDOUT

DEFINITIONS

In order to understand this lesson, you will need to know these definitions:

Profit: The basic definition of profit is the money left to a firm from its sales revenues after all costs have been met. The expectation of earning profit is an important incentive for business expansion and profits are also an important source of investment funds.

Net Profit or Net Income: Deducting cost of products sold, other operating expenses and business income taxes from sales revenue gives net profit. It is sometimes called accounting profits.

Sales Revenue: Sales figures are for the year ending December 31. They include sales from manufacturing and/or mining, rental and other revenues. Excluded are excise taxes, dividends, interest, and other non-operating revenues earned.

Stockholders Equity: Ownership equity is the net worth of a firm, or the value of the firm's total assets after subtracting the firm's total debt. It is the sum of capital stock, surplus, and retained earnings.

How do firms earn profits? Economists generally agree that profits arise from different sources depending on the situation of the firm or industry:

1. Profits may be viewed as a reward for firms which took a business risk and succeeded. Since the future is uncertain, every time a new busines opens or an old business expands or develops a new product, it is taking a risk. Profits are the reward if the decision was successful, losses will occur if not!

2. Profits may arise when a firm has a successful new invention or innovation. Before competing firms take advantage of this, the firm may earn high profits. This reward system encourages firms to develop new techniques.

3. Profits may result from monopoly or oligopoly power. OPEC countries were able to earn large profits as a result of such power. This type of profit does not promote economic efficiency.

4. Profits may be a result of pure luck. These are called windfall profits. For example, a popular President may mention he eats Brand X jellybeans and suddenly everyone wants that brand. Brand X owners will experience a rise in profits without any real risk-taking or innovation on their part.

HANDOUT

PROFIT INFORMATION SHEET

In 1980 the U.S. petroleum industry earned its largest profits ever. The twenty-seven largest U.S. oil companies had combined profits of $29.7 billion which had risen from $22.98 billion in 1979. However, in 1981, profits began to slide with a year-end total of $28.1 billion, and by 1982 had fallen to $21.9 billion which was below the 1979 level. Still the largest U.S. oil company, Exxon, had net profits of $4.2 billion in 1982, $5.5 billion in 1984, and $5.4 billion in 1986.

What do these large billion-dollar figures mean? Does it mean that the oil industry is more profitable than any other? Looking at just total dollars of net profit does not tell us very much about how well a firm or industry is doing. We want to know how those net profit dollars compare to total sales or revenues, how they compare to the value of stockholder's equity, and how they compare to the profitablity of other industries. When these comparisons are made, the total dollar figures might not sound so awesome.

Some of this information is given below:

Table 1

Accounting Profits for Top Two U.S. Oil Companies for Selected Years

Net Profits (in billions $)	1980	1982	1984	1986
Exxon	5.7	4.2	5.5	5.4
Mobil	3.3	1.4	1.3	1.4
Net Profits as % of Sales				
Exxon	5.5	4.3	6.1	7.7
Mobil	5.5	2.3	2.3	3.1
Net Profits as % of Equity				
Exxon	22.2	14.7	19.2	16.7
Mobil	25.0	9.4	9.3	9.2

Source: Fortune (annual 500 issue).

HANDOUT

PROFIT INFORMATION SHEET

Table 2

500 Largest Industrial Corporations
Selected Financial Items and Selected Industries:
1980, 1982, 1984, and 1986

Industry	Return on Stockholder's Equity (Percent)				Return on Sales (Percent)			
	1980	1982	1984	1986	1980	1982	1984	1986
Median return for all 500	14.4	10.9	13.6	11.6	4.8	3.6	4.5	4.1
Petroleum Refining	19.4	12.5	9.5	5.8	5.5	4.0	4.0	2.4
Mining, Crude Oil Production	21.0	9.0	13.8	7.7	9.2	3.0	6.3	3.8
Food	14.5	15.3	16.2	15.8	3.0	3.3	2.9	2.8
Motor Vehicles	8.1	5.1	15.4	10.1	2.6	1.7	5.2	3.0
Clothing	12.8	12.3	13.9	12.2	3.6	3.4	3.5	3.3

Source: Fortune (annual 500 issues)

Name: ______________________ Date: ______________________

WORKSHEET 12A

PROFITS

1. Use Table 1 to answer the following data:

a. Which company had the highest net profits in 1980?

b. Which company had the highest net profit as a percent of sales in 1984?

c. Which company had the highest net profit as a percent of stockholder equity in 1986?

d. Did net profits generally rise or fall between 1980 and 1982?

e. Did net profits generally rise or fall between 1984 and 1986? Why might this be the case?

2. Use Table 2 to answer the following:

a. In 1980, which industry is most profitable by both measures?

b. What other industries appear to be about as profitable as petroleum refining in 1980 and 1982 (comparing returns on owner's equity)?

c. Comparing "petroleum refining" and "food" industries, which industry performed better in 1980, 1982, 1984, and 1986 (comparing returns on owner's equity)?

d. Which industry showed improved profit performance between 1982 and 1984 (comparing stockholder's equity)?

3. Looking at the four possible sources of profits, which would you say are helpful and necessary to the economic system?

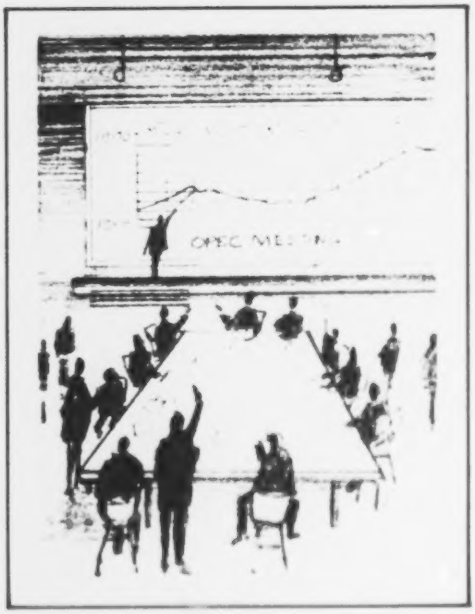
4. From what you know about the oil industry, describe the probable reasons why its net profits fell from 1980 to 1982 and then rose from 1982 to 1984.

5. What are the functions of profits in our economic system?

6. In the years represented, is petroleum refining or crude oil production more profitable than other industries?

Activity 13

OPEC: A CARTEL CASE STUDY



PROGRAM GOAL:

The learner should understand that the amount of energy resources and their availability for human activity vary.

OBJECTIVES:

Students will be able to describe factors which lead to a successful cartel.
Students will be able to analyze the loss in strength of the OPEC cartel.
Students will be able to give information on the historical development of OPEC and its impact on oil prices.

KEY VOCABULARY:

OPEC, cartel

MATERIALS:

Worksheet: 13A Cartels and OPEC

RATIONALE:

In Lessons 9 and 10 students observed cartel behavior in a simulation. In this activity they will learn about OPEC, a real-world cartel that has dominated news headlines for over a decade.

IMPLEMENTATION:

Distribute the reading assignment and worksheet.

EVALUATION:

Discuss Worksheet 13A, Cartels & Opec, answers.

Answers:

1. 1960, 1971

2. A price-fixing agreement

3. $35, 19

4. Unorganized buyers few major sellers, nearly equal market shares, similar beliefs, similar costs, new competitors unlikely.

5. All except the third.

6. Iran-Iraq war; new oil producers--Britain and Norway, Mexico; Nigeria cut prices.

7. Check latest news--OPEC is definitely weaker than in 1970's. Reader's Guide entries on oil prices and OPEC can help point students to this information. Current prices on crude oil per barrel can be found in the business section of each Sunday's New York Times, "Data Bank."

Name: ______________________ Date: ______________________

WORKSHEET 13A

CARTELS AND OPEC

A cartel is a group of sellers, business firms, or countries which have agreed to fix prices, market shares, or other matters of importance to them. The purpose is to increase their incomes above the level they would receive if they were competing. This is what happened in the second part of the "Oil Price Game."

Factors which make cartels most successful are when (1) buyers are unorganized, (2) there are a limited number of major producers or sellers so it is easy to form a cartel, (3) the sellers' market shares are similar in size so that a few members don't dominate, (4) the members share similar political beliefs, (5) members' production costs are similar, and (6) potential or possible new competitors are not likely.

The following excerpt details the success and recent problems of the OPEC cartel:

OPEC: FROM CARTEL TO CHAOS

September, 1960:
At this time several major world oil companies owned or controlled most world oil production facilities. They wanted the producing countries to lower prices.

Saudi Arabia, Iran, Iraq, Kuwait, and Venezuela met in Baghdad to map resistance to price cuts. A cartel of countries to confront the business cartel was formed: the Organization of Petroleum Exporting Countries (OPEC). With oil at $1.80 a barrel and in abundant supply, the world took little notice.

November, 1964:
Although unable to agree on production quotas, OPEC managed to negotiate a greater share of oil-company profits. OPEC price: $1.80.

June, 1967:
In the wake of the Six Day War, Arab oil producers vowed to boycott Israel's Western supporters, but two key OPEC members, Iran and Venezuela, refused to go along. The boycott collapsed. Price $1.80.

December, 1969:
Oil was struck in the North Sea. Coming only 18 months after the discovery of the Prudhoe Bay field in Alaska, the find represented a potential threat to OPEC. Price $1.80.

October, 1970:
Under Libya's threat to nationalization, that is, the takeover of their oil production facilities, several oil companies gave in to Libyan demands for more money. Other OPEC countries followed Libya-the "leapfrog effect" always dreaded by the oil companies. Price: $1.80.

February, 1971:
Twenty-three oil companies signed a price-increase agreement with OPEC-as an entity. OPEC was a real cartel. Price $2.18.

October, 1973:
Following the Yom Kippur War, Arab producers cut off oil shipments to the United States. OPEC doubled its price to $5.12.

January, 1974:
Shipments to the United States resumed, but at a redoubled price of $10.95. A world-wide recession began.

Jan-Feb, 1979:
In the turmoil of the Khomeini revolution, Iranian oil production dropped to 500,000 barrels a day, from 6 million. Subsequent shortages and OPEC surcharges pushed prices up. Average OPEC price: $14.59.

May, 1981:
OPEC has raised the average price up to nearly $35-but now confronted a growing global oil glut.

January, 1983:
At an emergency Geneva meeting, OPEC failed to quell unofficial discounting by members. Expectations of a general OPEC price cut grew. Official average price: $33.

February, 1983:
Britain and Norway cut North Sea prices. Nigeria became the first OPEC member to break ranks by cutting prices. Key OPEC nations agreed in principle to a cut hoping to forestall an all-out price war.

April, 1986:
World price of crude oil dips below $10 per barrel which resulted from a decline in world consumption from a 1979 peak of 65.1 million bbls. a day to 59.2 million bbls a day by 1985. At the same time production in non-OPEC oil-producing countries had been rising, breaking OPEC's power further.

January, 1988:
Price of crude oil has remained betwen $17 and $18 per barrel for the past year.

Sources: Christoph Blumrich, "OPEC: From Cartel to Chaos," Newsweek, March 7, 1983, pp. 62-63, and, Stephen Koepp, "Cheap Oil," Time, April 14, 1986, pp. 68.

Questions:

1. According to the reading, OPEC was formed in _____________ but became a successful cartel in _____________.

2. What kind of agreement led to the establishment of OPEC as a real cartel?

3. During the ten years of OPEC's successful cartel, prices rose from $1.80 per barrel to _____ per barrel, an increase of approximately ___________ times.

4. What factors help make a successful cartel?
5. Which of these were present for OPEC in the early 1970's?
6. What incidents happened to cause problems for OPEC?
7. What is the situation today with regard to the OPEC cartel?

Activity 14

WORLD ENERGY MARKETS

PROGRAM GOAL:

The learner should understand that the amount of energy resources and their availability for human activity vary.

OBJECTIVES:

Students will identify countries or regions from a world map.
Students will determine the relationship between oil supply and demand for each country or region from the data.
Students will define the terms, imports and exports.
Students will explain why nations trade for oil.
Students will construct a bar graph depicting U.S. dependence on energy imports.

KEY VOCABULARY:

OPEC countries, imports, exports

MATERIALS:

Handout:	Map
Worksheets:	14A Map Worksheet 14B United States' Dependence on Energy Imports

RATIONALE:

One of the reasons the OPEC cartel has had so much power over oil prices is that OPEC countries control a large fraction of oil production. In many other areas of the world consumption is greater than production. Where domestic demand is greater than supply, prices rise and people turn to imported energy. In this exercise, students will recognize which regions of the world are importers of energy and which are exporters, and consequently, how interdependent nations are.

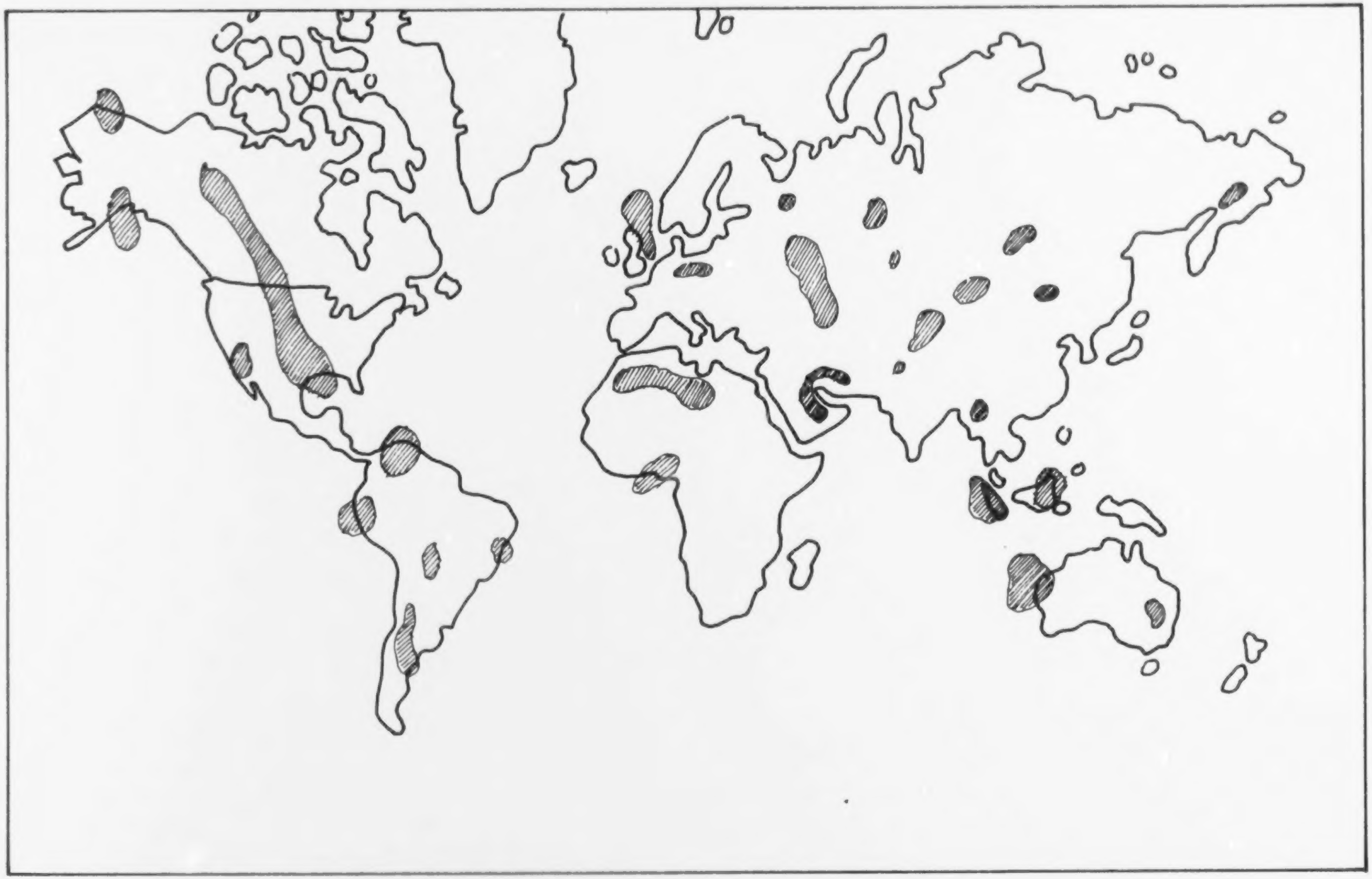
IMPLEMENTATION:

Have students complete Map Worksheet 14A. The aid of a map is necessary. You may wish to have them work in groups on this. United States' Dependence on Energy Imports Worksheet 14B, is an exercise in graphing and also illustrates U.S. changing dependence on imports. Another good exercise would be to discuss why the percent of imports relative to total supply has changed.

EVALUATION:

Answers to Map Worksheet 14A: #1, 2, 3, 4: Teacher can check or have students check with labeled country map #4. Great Britain is the only net exporter on this list. All others should be labeled "M."

Worksheet 14B "United States' Dependence on Energy Imports": Check to be sure students understand graph construction.



Major oil deposits ▨

Shaded areas indicate the world's major oil deposits. They do not show the quantity of oil located in each region. It is estimated that 53 percent of the known oil reserves are in the Middle East. (See * on map.)

Name: ______________________ Date: ______________________

WORKSHEET 14A

MAP WORKSHEET

From the map you can see that the world's major oil deposits are scattered widely. The map does not show where the major oil consumers are. If a country consumes more than it produces, it must **import** oil. Other countries **export** oil when they produce more than is consumed inside the country.

The major oil exporting nations include members of OPEC (Organization of Petroleum Exporting Countries), and Mexico, the Soviet Union, and the United Kingdom. OPEC members include Middle-Eastern nations of Algeria, Iraq, Iran, Kuwait, Libya, Qatar, Saudi Arabia, and United Arab Emirates, plus three nations outside the Mid-East, Venezuela, Indonesia, and Nigeria.

Map Exercise:

1. Put an "X" over the starred Middle-Eastern region, Libya, Algeria, and approximately where Nigeria and Indonesia and Venezuela are located. These countries are OPEC members.

2. The Soviet Union is an exporter of petroleum. Put an "X" over the Soviet Union.

3. Mexico is also a petroleum exporter. Put an "X" over Mexico.

4. Look at the following data. Decide whether each country is an exporter or importer of oil. Put an "X" in front of the exporters and "M" in front of importers. Then mark the X or M over that country's location on the map.

1986 Averages in 1,000 barrels per day.

	Great Britain	Canada	USA	Japan
Petroleum Consumption	1,581	1,518	16,281	4,383
Petroleum Production	2,548	1,471	8,680	-----

	West Germany	France	Italy
Petroleum Consumption	2,494	1,832	1,668
Petroleum Production	----	----	----

Data from: US Energy Information Administration, Monthly Energy Review, July, 1987, pp. 110, 111, 113.

Name: ______________________________ Date: ______________________________

UNITED STATES' DEPENDENCE ON ENERGY IMPORTS
WORKSHEET 14B

Below is some information on U.S. energy imports. Use this information to construct a bar graph which shows our changing dependence on foreign imports over a 25 year period. The first year is done for you.

ENERGY SUPPLY BY SOURCE

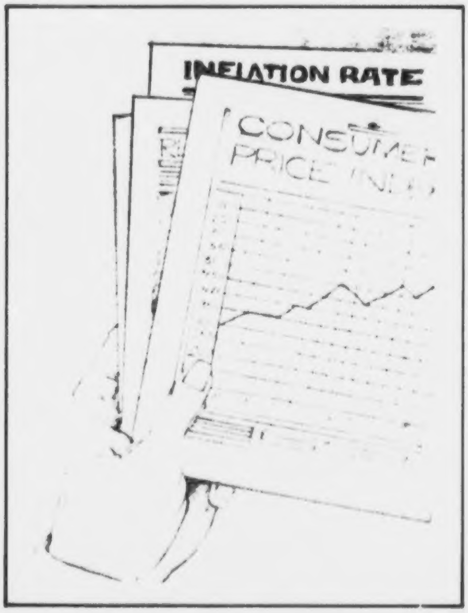
(Supply in quadrillion British Thermal Units. Imports as percent of total)

	1960	1965	1970	1975	1980	1985
Total energy supply	45.6	54.9	69.5	73.1	79.6	76.7
Imports:						
Total imports as % of total supply	9.3	10.8	12.1	19.3	20.1	18.6
Oil imports as % of total supply	4.8	4.5	4.0	11.9	14.0	9.0

Source: **Statistical Abstract of the United States, 1982**, Table no. 972, p. 572, and **1987**, Table no. 933, p. 543

Activity 15

INFLATION AND ENERGY PRICES



PROGRAM GOALS:

The learner should understand that the development of energy resource and the use of these resources create impacts on environmental and economic systems.

The learner should understand that the amount of energy resources and their availability for human activity vary.

OBJECTIVES:

Students will define price, price level, inflation, and deflation.
Students will calculate changes in a price index given price information.
Students will compare rates of change in prices.

KEY VOCABULARY:

Consumer price index (CPI), energy price index (EPI), price, price level, inflation, deflation.

MATERIALS:

Handout:	The Consumer Price Index
Worksheets:	15A Consumer and Energy Price Index
	15B Computing a Weighted Consumer Price Index

RATIONALE:

When the average level of prices for all goods and services is rising, we are experiencing a period of inflation. When the price level remains the same we experience price stability. But how do we measure price level changes? One way is to construct a general price index such as the well-known Consumer Price Index (CPI). We can also create an energy price index (EPI) to measure price level changes for energy resources. The construction and use of the CPI and EPI is the subject of this lesson.

IMPLEMENTATION:

1. Ask the class to think of energy related products they or their families have purchased. Examples: electricity, heating fuel, gasoline, etc. Then go down the list and ask whether the price of the item has been going up, going down, or staying stable. Put arrows beside each to indicate direction. If most are up, then discuss inflation. (Deflation, if down). Define inflation: when averge of all prices is rising over a period of time.

2. Pass out handout and worksheets on price indexes.

3. Another good activity is to look at old magazines or catalogs for prices and compare to today's prices. Make up a price index for a list of items.

EVALUATION:

Answers to Worksheets:

Worksheet 15A.."Consumer and Energy Price Index": A. (1) Prices rising, (2) about 20%, (3) prices dropped (4) [(420-120)   120] x 100 = 250% B. (1) Inflation (2) Arab oil embargo cut supply; OPEC countries formed a strong cartel to raise prices and restrict their supply and in U.S. the government stopped controlling prices (3) Check CPI for latest information.*

Worksheet 15B--"Computing a Weighted Consumer Price Index": Oil, $13; Kerosene, $18; Gas, $37.50; Total, $68.50.
1. (68.50   47)100 = 148
2. Period 2, 26%; Period 3, less than 22% because you started at 126 in Period 3 not at 100.
3. About 48% = (148-100)

---

* Recent information on the CPI and items covered in it can be found in the **Monthly Labor Review** available in most public libraries. It is also summarized in the U.S. Statistical Abstract each year.

HANDOUT

THE CONSUMER PRICE INDEX

The energy price index is compiled from the different fuel prices measured in the consumer price index. It includes prices of fuel oil, coal, bottled gas, piped gas, electricity, motor fuel, motor oil, coolant, etc.

The Consumer Price Index is a measure of price trends for commonly used consumer goods and services. Each month percentage price changes are computed for some 400 different items which are defined as typical of what consumers buy. This is done to estimate how much our cost of living changes from one period to the next.

The eight categories of items that make up the "market basket" are:

- Food and beverages
- Housing
- Apparel & Upkeep
- Transportation Other
- Medical Care
- Entertainment
- Personal Care

The items are chosen by a consumer survey of 40,000 families to determine what is "typical." This is updated roughly every ten years.

The price of every item is weighted to reflect its importance in the consumer's budget. For example, a 16-oz. loaf of bread might have a higher weight attached to its price than a 16-oz bottle of ketchup since more is spent on bread annually than on ketchup.

Consumer prices are then presented in index form which allows us to compare price changes from some starting point called a base. The base is always set at 100 which stands for 100%. If prices rise 10% in the next year, the index would rise to 110. An index of 300 means prices are 300% or 3 times what they were in the base year.

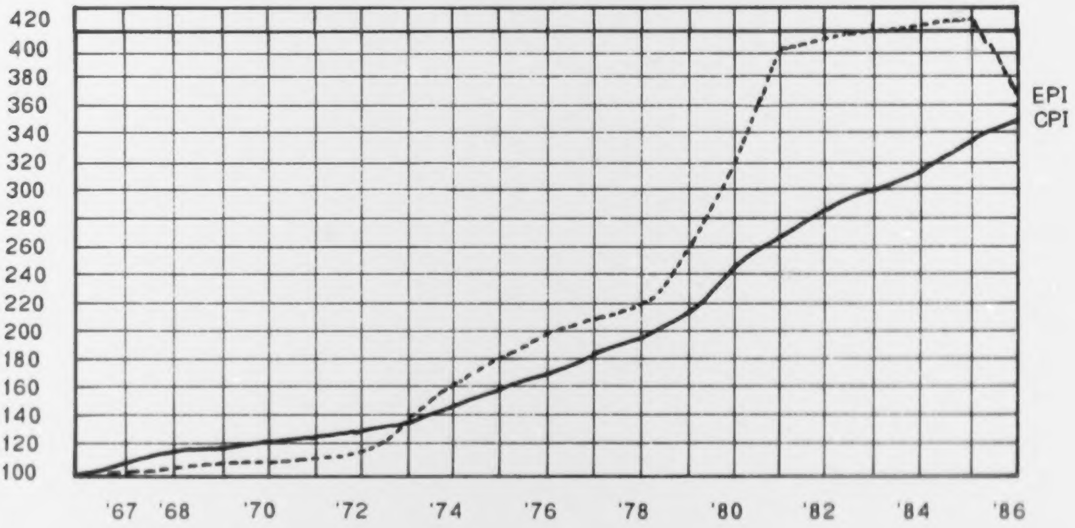
Currently the base year for the CPI is 1967. By 1988, the CPI was well over 300 which means the average level of consumer prices is more than 3 times higher than the average level of prices in 1967. Put another way, a family's personal income would have to triple by 1988 just to maintain the same living standard they had in 1967.

Name: ______________________ Date: ______________________

WORKSHEET 15A
Consumer and Energy Price Index

The graph below pictures the behavior of the CPI and EPI from 1967 to 1986. After examining it, answer the questions that follow.

Consumer and Energy Price Index
(1967 = 100)



Energy prices of fuel oil, coal, bottled and piped gas, electricity, motor fuel, motor oil, coolant, etc. Source: Department of Labor, Bureau of Labor Statistics.

A. Look at the graph on the Consumer Price Index (CPI).

(1). What can you say about changes in both price levels since 1967?

(2) What was the percent change in consumer prices from 1967 to 1973 in energy prices?

(3) What happened to energy prices between 1985 and 1986?

(4) Look at the change from 1973 to 1982. What was the percent change for that period in energy prices? (Extra Credit Problem)

B. "Inflation" is defined as a period of time when the average of all prices--or the general price level--is increasing.

(1) Were the 1970's a period of inflation? Why do you think so?

(2) Compare the energy price index to the CPI. What happened in 1973 to cause energy prices to rise so rapidly? What happened after 1978? (See lesson on OPEC.)

(3) What has been happening to the general price level during the past 12 months? Has it been stable? Going up? Going down? Fluctuating?

Name:______________________________ Date:______________________________

WORKSHEET 15B

COMPUTING A WEIGHTED CONSUMER PRICE INDEX

This handout will teach you how to calculate a weighted price index. The Consumer Price Index (CPI) needs to be weighted to reflect the importance of various goods and services in the average consumer budget. Some items are purchased more frequently or in greater quantity than others. Therefore, their prices need to be given a greater weight.

In the following exercise, you will calculate a simplified Consumer Price Index and be able to see how weighting is done. The exercise simplifies the CPI calculation in two ways: (1) it covers only a single part of the entire CPI and (2) the category in the exercise contains only three items while the actual category in the CPI covers many items. The exercise shows the construction of the index for the same month in three successive years. The calculations for the first two periods have been done for you and are explained. After you read the explanation and examine the calculations for the first two periods, calculate the index for the third period.

Look over the examples for the first two months that appear below and the explanation that follows. Note that for each item, the Price per Unit given in column 1 is multiplied by the weight (Quantities Bought) in column 2. The results are the Weighted Expenditures shown in column 3.

	(1)	(2)	(3)	(4)
Item	Average Price Per Unit	Quantities Bought	Weighted Expenditures (= col. 1 x col. 2)	Index=100 Times (Current Base ÷ Totals)
	Period One (base month, first year)			
Motor Oil (Quart)	$0.50	20 quarts	$10.00	100(47 ÷ 47)=
Kerosene (gallon)	$0.40	30 gallons	$12.00	100(1) =
Gasoline (gallon)	$1.00	25 gallons	$25.00	100=Base Index
		Total =	$47.00	
	Period Two (same month, second year)			
Motor Oil (quart)	$0.60	20 quarts	$12.00	100 (59.50 ÷ 47)=
Kerosene (gallon)	$0.50	30 gallons	$15.00	100 (1.266)=
Gasoline (gallon)	$1.30	25 gallons	$32.50	126.6 = Index
		Total =	$59.50	

Similar to an exercise in Master Curriculum Guide for the Nation's Schools, Part II, Strategies for Teaching Economics: Junior High School Level (Grades 7-9), 1981. Joint Council on Economic Education, 2 Park Avenue, New York, NY 10016

Look at the numbers for Period One. The first column shows the prices at which a family purchased items in one month. The second column tells how much a family purchased of each item during the month. The figures in the third column result from multiplying the first two columns together. For oil, the family paid 50 cents per quart and bought 20 quarts. Therefore, it spent $10 on oil during the month. Similar calculations are made for gasoline and kerosene.

Now comes your turn. Compute the index for Period Three in the same way as just explained for Period Two. That means you will multiply the information in columns 1 and 2 for Period Three and write the results in the third column. Then use the total of the items in the third column to compute the price index for Period Three compared to Period One as explained in the previous paragraph.

Period three (Same month, third year)

Item	(1) Average Price per Unit	(2) Quantities Bought	(3) Weighted Expenditures (= col. 1 x col. 2)
Period one (base month, first year)			
Motor Oil (quart)	$0.65	20 quarts	$______
Kerosene (gallon)	$0.60	30 gallons	$______
Gasoline (gallon)	$1.50	25 gallons	$______
		Total energy	$______

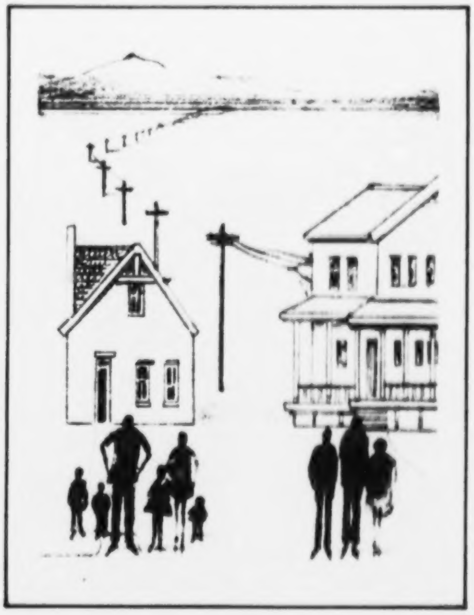
Directions: Compute the price index for Period Three in the space below. Remember, Index = 100 (Current Total Base Total).

Questions:

1. What is the price index for Period Three?
2. Did the price index rise faster in Period Two or in Period Three?
3. What is the total percent rise from Period One to Period Three?

Activity 16

ENERGY PRICES AND ECONOMIC JUSTICE



PROGRAM GOALS:

The learner should understand that the development of energy resource and the use of these resources create impacts on environmental and economic systems.

The learner should understand that the amount of energy resources and their availability for human activity vary.

OBJECTIVES:

Students will state how low-income persons are affected by rising energy costs.
Students will compare the effects of high energy costs on different income groups.
Students will use a decision-making grid to analyze the advantages and disadvantages of alternative low-income policies.

KEY VOCABULARY:

Poverty level, median income

MATERIALS:

Handout:	Group Questions
Worksheet:	16A. Decision-Making Grid

RATIONALE:

Low-income people are affected more by high energy costs than the rest of the population. Since most of their energy expenditures are on necessities like heating, cooling, cooking, refrigeration and light, it is difficult for them to avoid the impact of rising costs. This issue of economic justice or fairness is one of the major concerns of economic policy. In this activity, information is given which highlights this problem and alternative solutions are suggested for student analysis.

IMPLEMENTATION:

Distribute information and worksheets.
Have students complete the questions.
If the class is large, a day or two before this activity:
1. Divide the class into two groups, A and B.

2. Assign "Group A Questions" to group A and similarly for "Group B Questions." Group B members will need to get estimates of their electric and gas bills from their families.

In class:
1. Have each group complete their assigned questions.

2. Have one member from each group report on the information they found, so that the whole class can complete the individual worksheets. Everyone should have information for Group A and B questions.

3. On the board calculate the following:
Income remaining after paying energy costs for poor family of four:
a. Poverty level income (#A-1):
minus
b. Gas and electricity cost estimate (#B-3)
- -
c. Income left for other expenses
(food, housing, clothing, etc.) =

Income remaining after paying energy costs for median income family:
a. Median income #(A-4):
minus
b. Gas & Electric Averages (#B-2):
- -
c. Income left for other expenses
(food, housing, clothing, etc.) =

4. Discuss the results.

5. Show students a sample of decision-making grid from lesson #2 and explain the procedure for filling in grid squares. Have students complete the decision-making grid after discussing alternative solutions to the problem of energy costs and poverty.

EVALUATION:

Discuss completed worksheets and decisions made about alternative selections.

GROUP QUESTIONS

HANDOUT

Group A

In 1986 about 14% of all Americans were living below the poverty level. For a family of four a poverty level income was defined as approximately $11,200 compared to the median family income of $29,500 in that year. You can find more recent statistics about poverty in the latest issue of the Statistical Abstract of the United States published by the U.S. Department of Commerce, Bureau of the Census. Use this to help you answer the following:

1. What was the poverty level income for a family of four last year?

2. What percent of the U.S. population was below the poverty level?

3. What percent of all U.S. families were below the poverty level?

4. Find the median family income in the U.S. and your state for last year.

(Median income means half of all families earn more and half earn less.)

Group B

It has been estimated that typical low-income families consume about one-half the electricity and one-fourth the natural gas of a typical middle-income family.

1. Using your family's monthly gas and electric bills, estimate what your family spent on electricity last year. __________; On natural gas (If you heat with another fuel, skip the question.)____.

2. Write down each student's answers to the last questions and find the average electric bill and natural gas bill for the group.

Electric: __________
Gas: __________

3. Now take one-half of the average bill for electricity and one-fourth the average natural gas bill.

1/2 x Electric average: __________
1/4 x Gas average: __________

This is a rough estimate of what a low-income family would spend. We have seen that the poor may not have enough income to pay for energy and other necessities. Energy prices are predicted to rise more rapidly than incomes in the 1980's. This means the poor will have to pay even greater proportions of their incomes for energy costs. Yet they will need more income for other necessities. This is the problem. Here are some alternative solutions. (Add any others you think of. Evaluate each alternative in terms of five or six criteria. Some examples of criteria follow. (Add others.) To complete the grid: if an alternative seems to meet a criterion, put a plus sign (+). If not, mark a minus (-). Use a question mark (?) if the criterion is not relevant or if you are uncertain.

Name: ______________________ Date: ______________________

WORKSHEET 16A

DECISION-MAKING GRID

	Criteria:				
Policy Alternatives:	Saves energy resources	Easy to administer	Preserves producer's freedom	Helps the poor	Encourages development of new energy sources
Regulate energy prices					
Help educate and provide poor with conservation methods					
Give aid for "soft" energy use: wood, sun, wind (for rural use mainly)					
Set lower rates for smaller users; higher for larger users					
Provides subsidies (money to help pay bills)					
Provide free weatherization					
Do nothing					

MAKE YOUR CHOICE

Decision: ____

Reasons: ____

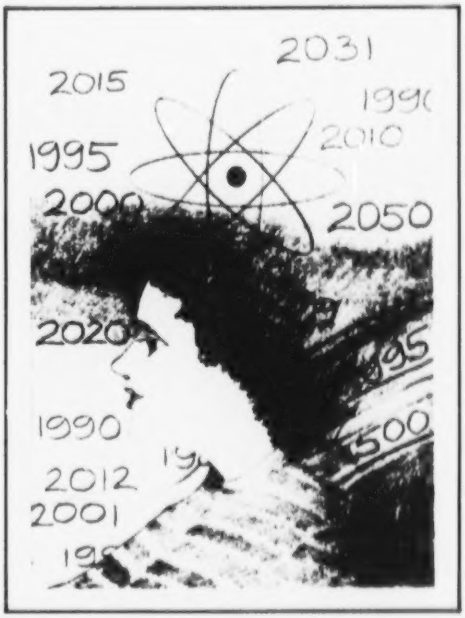
____

____

____

Activity 17

ENERGY FUTURES



PROGRAM GOAL:

The learner should understand that energy sources, technology, and consumption patterns of the future may be different from those of the past or present.

OBJECTIVES:

Students will rank order various energy sources in different time periods based on historical graph information.
Students will identify alternative energy sources for the future.
Students will research a few facts about alternative energy sources.
Students will analyze the possible impact of various policy alternatives that would encourage development of other fuels.

KEY VOCABULARY:

Energy consumption, alternative energy sources

MATERIALS:

Handout:	Composition of U.S. Primary Energy Consumption, 1920-1995
Worksheets:	17A Sources of Energy Consumption, 1850-1980 17B Energy Sources of the Future

RATIONALE:

The consumption of energy has changed substantially in the United States in the past century. Energy consumption will probably be much different in the future. This lesson examines past trends and considers alternative sources of energy for the future.

IMPLEMENTATION:

Worksheet "Sources of Energy Consumption, 1850-1980" can be used to demonstrate which fuels are important today and that energy sources have varied greatly over the century. This is a foundation for the worksheet, "Energy Sources of the Future," where students can examine alternative energy futures. You may wish to do part H as a group brainstorming exercise.

EVALUATION:

Correct worksheets, discussing answers with students.

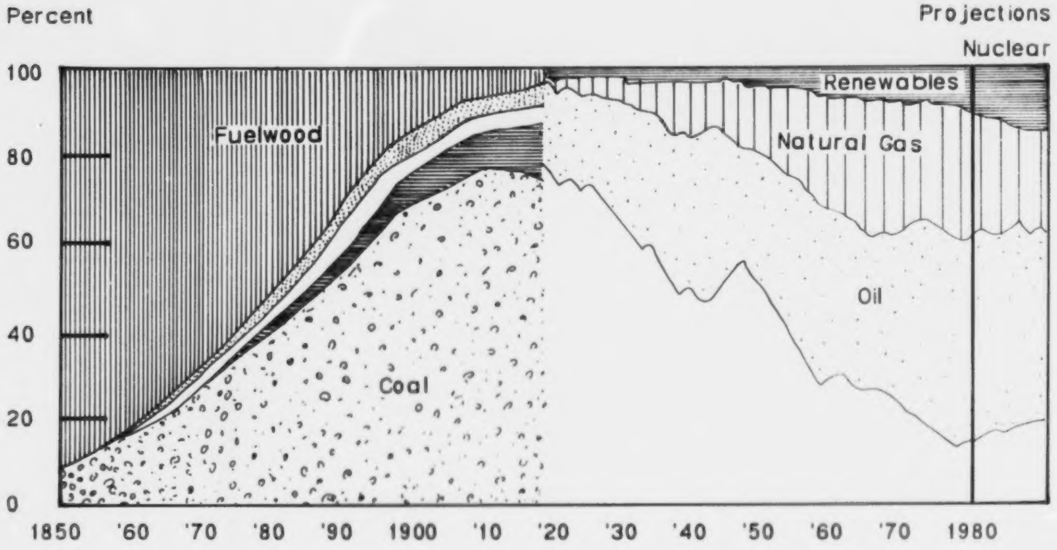
Worksheet 17A, Sources of Energy Consumption, 1850-1980:
1. Oil, gas, coal, hydro, nuclear, wood;
2. Wood, coal, and oil;
3. No; changes in cost of production and relative scarcity led to changes in relative prices; new technology encourages use of some fuels over others, e.g., auto use led to more oil demand;
4. Probably due to U.S. attempts to reduce our dependence on oil imports, while tough policies have not been adopted against imports, some incentives and encouragement was given to alternative sources in the last decade.

Worksheet 17B, Energy Sources of the Future: A. Gas from coal; B. Geothermal; C. Oceans; D. Fusion; E. Wind; F. Biomass; G. Solar energy; H. Some possibilities:
1. De-control oil and gas prices. As these prices were allowed to rise naturally, producers increased supplies through new exploration and costlier extraction methods. Also higher oil and gas prices made the use of alternative fuels more attractive.
2. Subsidize research and/or production of new types of energy. Private corporations alone do not always have the resources to do research in areas where the social benefits may outweight the private benefits.
3. Give tax breaks to developers of alternative energy sources to encourage production.

Name: ______________________________ Date: ______________________________

WORKSHEET 17A

SOURCES OF ENERGY CONSUMPTION, 1850-1980



Sources: 1850-1960 H.H. Landsberg and S.H. Schurr, Energy in the United States (New York, Random House, 1968)
1960-1980: U.S. Energy Information Administration, 1981 Annual Report to Congress, Vol II, (Natural gas liquids, shown separately in both sources, are combined with oil in the chart.)
1920-1040: U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook
(Annual issues), 1950-1984 Energy Information Administration, Annual Energy
Review 1984 (1985), 1985-1995 Energy Information Administration, Annual Energy Outlook 1984 (1985)

The graph shows that sources of energy consumption change over the years.

1. List sources of energy used in 1980 putting them in order from most to least important.

2. Which fuel was most important in 1870? ________________ In 1900? ________________ In 1970? ________________ In 1985? ________________

3. Does the graph give information about why coal and wood are relatively less important sources of fuel today?

What is your opinion about why these changes have occurred over the years?

4. Why do you think coal and nuclear energy are predicted to increase in importance as future sources of energy consumption?

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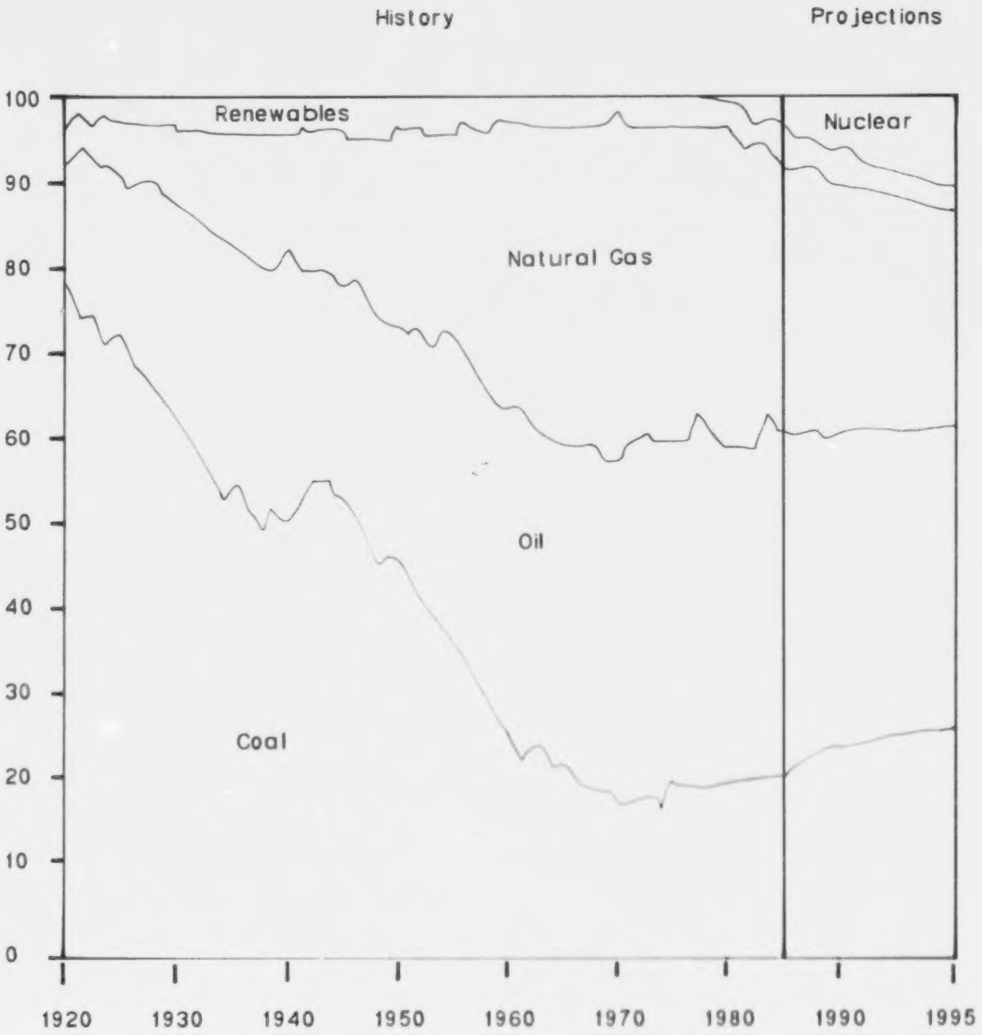
HANDOUT

COMPOSITION OF U.S. PRIMARY ENERGY CONSUMPTION, 1920-1995

(Cumulative Percent)



Source: U.S. Department of Energy. Energy Information Administration. Annual Outlook for U.S. Coal 1985. Published May 1985. p. 6.

Name:____________________________ Date:____________________________

WORKSHEET 17B

ENERGY SOURCES OF THE FUTURE

Below are several sets of facts about sources of energy that have possibilities for much greater use in the future. Use the encyclopedia or other information materials to help you choose the correct title for each set of facts from the list. Add one more important fact about each energy source. You may want to add a fact about cost, environmental effects, or the potential for future use of the fuel.

Future energy sources

Biomass	Coal Gasification	Geothermal
Wind	Fusion	Petroleum
Solar	Oceans	Nuclear

A. ________________________

(1) A synthetic fuel where coal is crushed, dried, and heated up to over 1500 degrees F at high pressure causing chemical bonds of coal to break apart and form gas.

(2) Presently is higher cost than natural gas but this may change if supplies of natural gas become more scarce and prices are no longer controlled.

(3)

B. ________________________

(1) Heat of the earth captured from fluids beneath the surface of the earth.

(2) It is close enough to the surface in a few areas, especially in western United States.

(3)

C. ________________________

(1) Tides and currents can be used to turn turbines for electrical energy.

(2) Energy can be obtained by taking advantage of the temperature differential between surface waters and depth.

(3) Seaweed (kelp) bioconversion can be used since kelp grows easily and can be used for fuels and weeds.

(4)

D. ______________________

(1) This is the power which creates the heat and light in the sun.

(2) The main fuel used is a variety of hydrogen which is abundant since it is an element found in water.

(3) Scientists still are trying to develop machinery that can produce self-sustaining fusion reactions. Safety and cost are other production problems.

(4)

E. ______________________

(1) A windmill is a simple machine using this form of energy.

(2) This power can be converted to electricity and stored in batteries or to heat and stored in hot water or other hot materials.

(3) This power can pump water to a high reservoir and then water power can be used to generate electricity.

(4)

F. ______________________

(1) Products like wood can be burned to create energy.

(2) This source can be converted into synthetic gas, fuel oil, methane.

(3) This source can be fermented or digested by organisms to create biogas or fuels such as alcohol.

(4)

G. ______________________

(1) Houses can be designed to take advantage of sunlight's warmth in winter and to protect from their heat in summer. These are passive uses.

(2) Sunlight can be used to heat water and other materials and then the stored heat can be used.

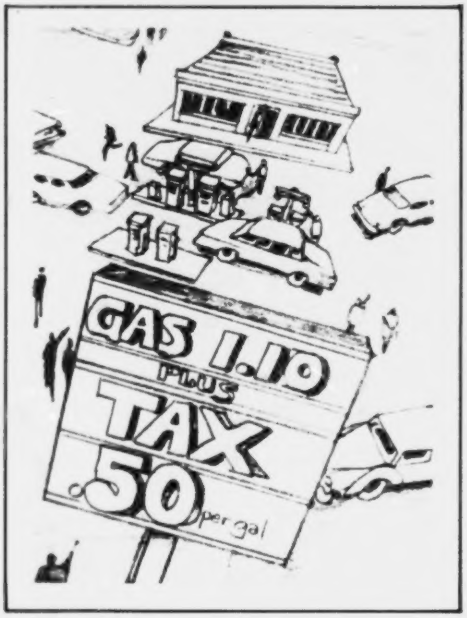
(3) Sunlight can be converted to electricity through photosensitive materials. This is called a photovoltaic system.

(4)

H. List two or three possible policies that government could use to encourage development and use of these alternative fuels.

Activity 18

ENERGY AND TAXES



PROGRAM GOAL:

The learner should understand that the development of energy resource and the use of these resources create impacts on environmental and economic systems.

OBJECTIVES:

Students will identify equilibrium price and quantity on a supply and demand graph.
Students will show how a tax shifts the supply curve.
Students will determine the amount of a tax increase borne by buyers and sellers using a graphical example.
Students will explain why a tax might impose a larger burden on one income than another.

KEY VOCABULARY:

Tax burden, equilibrium price and quantity, elastic, inelastic.

MATERIALS:

Handout:	Who Pays for a Cigarette Tax? Buyers or Sellers? Figure 1, 2, and 3, The Cigarette Tax Who Pays the Gasoline Tax ?
Worksheet:	18A Who Pays for the State Tax on Gasoline: Buyers or Sellers?

RATIONALE:

Tax incidence involves determining who bears the burden of a tax. When a tax is imposed the burden can often be shifted from the intended group to an unintended group. The shifting occurs because economic reactions to the tax cause changes in prices and output. This activity will provide examples and a graphical demonstration of how the tax burden can be shifted when a state excise or state tax is imposed on a specific good or service.

IMPLEMENTATION:

1. Pass out student handout on " Who Pays the Cigarette Tax." Read through the handout with students. Be sure to draw the supply and demand graphs on the chalkboard or have transparencies prepared for Figures 1, 2, and 3. Go through the example with students making sure you answer any questions. (See student worksheets for Figures 1, 2, 3.)

Give students worksheet on "Who Pays The Gasoline Tax." Have students complete it in class or as a homework assignment. Discuss the answers to the questions with the students.

EVALUATION:

The following are the answers to Worksheet 18A, Who Pays for the State Tax on Gasoline: Buyers or Sellers? You will be responsible for preparing the graph to share with students.

1. The pretax equilibrium price is $1.20 per gallon. The equilibrium quantity is 20,000 gallons of gasoline a day.

2. The after-tax equilibrium price is $1.50. The equilibrium quantity is 18,000 gallons. The supply curve shifts upward $.40 at each and every point.

3. The amount of the $.40 tax borne by buyers is $.30. The amount of the $.40 tax borne by sellers is $.10.

4. In this example, buyers pay most of the tax. The reason is that gasoline consumption is relatively insensitive to change in price. As the price increases, drivers do not cut back much on their consumption. Consequently, most of the tax increase will be passed on from seller to buyer in the form of higher prices. Sellers, however, can not pass on all of the tax in the form of higher prices so they too bear some of the burden.

5. As prices rise, consumers cut back on their consumption of gasoline somewhat. This action keeps prices from rising by the full amount of the tax.

Note: When consumption is sensitive to changes in price, demand is said to be elastic. When it is insensitive, demand is called inelastic. More exactly if the percent change in quantity demanded is greater than the percent change in price, demand is elastic. If percent change in quantity is less than percent change in price, demand is inelastic.

HANDOUT

Who Pays for a Cigarette Tax
Buyers or Sellers?

Suppose that a state tax is passed that requires all merchants to impose a $.20 tax on a pack of cigarettes. Supply and demand analysis can show us how the economic burden of the tax is distributed. To illustrate, study the supply and demand graph example for cigarettes in Figure 1.

Figure 1: Equal Tax Burden on Buyers and Sellers

Without the tax, suppose that the typical (equilibrium) price of a pack of cigarettes is $.65. At that price assume 20,000 packs are sold each day in the state. Given this information the equilibrium price and quantity on the graph below would be at point A.

Now the $.20 tax on cigarettes is imposed. The new tax will change the equilibrium. The tax adds $.20 to the seller's cost of doing business since they must now pay the state $.20 for each pack sold. The supply curve shifts upward at each and every price by $.20 as the sellers try to impose the increased cost on the buyers.

But cigarette buyers also respond to the tax increase. They cut their consumption by buying 4,000 fewer packs of cigarettes than they did before. In other words, buyers respond to the increase in price by reducing the quantity of cigarette packs they purchase.

A new equilibrium price and quantity are established at $.75 per pack, with 16,000 packs sold. This equilibrium is illustrated at point B where the new supply curve, S2, intersects the demand curve, D1.

Who bore the burden of the cigarette tax? The answer is both buyers and sellers. Before the tax, sellers sold cigarettes for $.65 a pack and could say they received a $.65 in net sales revenue. After the tax, sellers sold cigarettes for $.75, but they had to pay $.20 in taxes to the state. Thus, sellers had an after-tax revenue of only $.55, a $.10 loss on each pack of cigarettes sold.

The other half of the $.20 tax burden was borne by the buyers. Before the tax increase, buyers paid $.65 per pack. After the tax increase, they paid $.75, so buyer cost rose $.10 .

Is this the way it always works? Do the buyers and sellers always split the tax burden? Certainly not. For some goods, buyers may pay all of the tax and sellers may pay almost none of it. The answer for each case depends upon how sensitive the quantity demanded is to changes in price.

Figure 2: More Tax Burden on Buyers

The situation where buyers bear most of the new cigarette tax burden can be illustrated in Figure 2. Here, the supply curves stay the same, but the demand curve is steeper than in Figure 1. After the $.20 tax increase the new equilibrium price will be $.80 and the new equilibrium quantity will be 18,000 packs sold. In this case, buyers bear $.15 of the $.20 tax burden. Sellers bear only $.05 of the tax burden.

Buyers also cut their consumption of cigarettes by only 2,000 packs instead of 4,000 packs as was the case in Figure 1. This indicates that the quantity demanded for cigarettes is less sensitive to price increases. As prices rise, buyers make only small cuts in their consumption. Whan price insensitivity is present, buyers usually wind up bearing most of the tax burden. (Demand is inelastic.)

Figure 3: More Tax Burden on Sellers

The situation where sellers bear most of the cigarette tax burden can be illustrated in Figure 3. Here, the supply curves also stay the same, but the demand curve is flatter than in Figure 1. After the $.20 tax increase, the new equilibrium price will be $.70 and the new equilibrium quantity will be 14,000 packs sold. In this case, sellers bear $.15 of the $.20 tax burden since they charge $.70 for the pack of cigarettes, but they receive after-tax revenues of only $.55 a pack. Buyers bear only $.05 of the tax burden. Buyers also cut their consumption of cigarettes by 6,000 packs instead of by only 4,000 packs as was the case in Figure 1. This indicates that the quantity demanded for cigarettes is quite sensitive to price increases. As prices rise, buyers make large cuts in their consumption. When price sensitivity is present, sellers usually wind up bearing most of the tax burden. (Demand is elastic.) Therefore, determining who pays the tax burden involves identifying how sensitive the quantity demand is to a change in price.

Summary: In the real world, cigarette consumption has been found to be relatively insensitive to price changes like in Figure 2. In other words, as prices increase, people do not cut back on their purchases very much. When cigarette taxes are increased, most of the burden is borne by cigarette buyers, not cigarette sellers. (The demand for cigarettes is said to be inelastic.) Cigarette taxes have also been popular since they are certain to produce more tax revenue for the government.

FIGURE 1
The Cigarette Tax

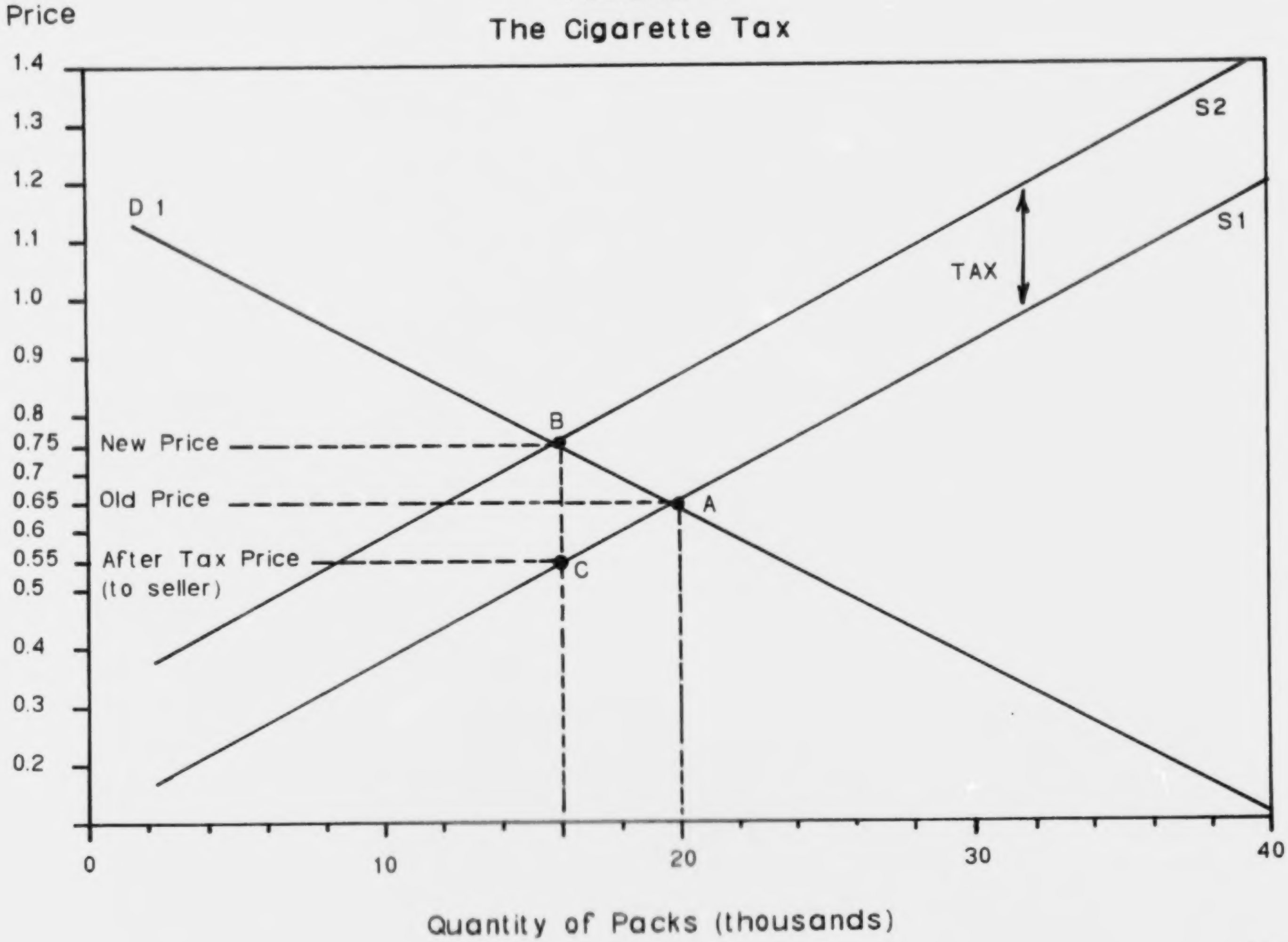


FIGURE 2

The Cigarette Tax

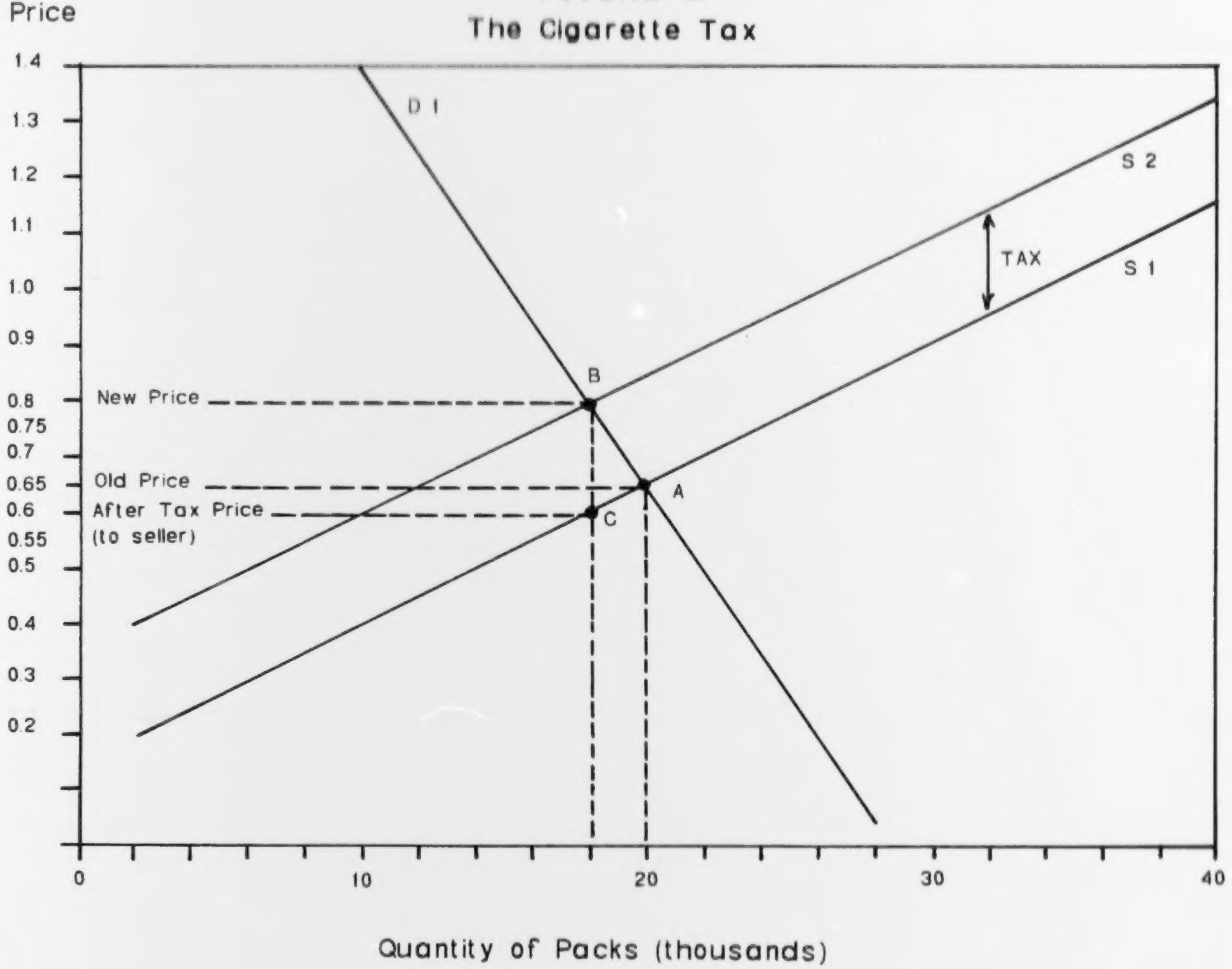
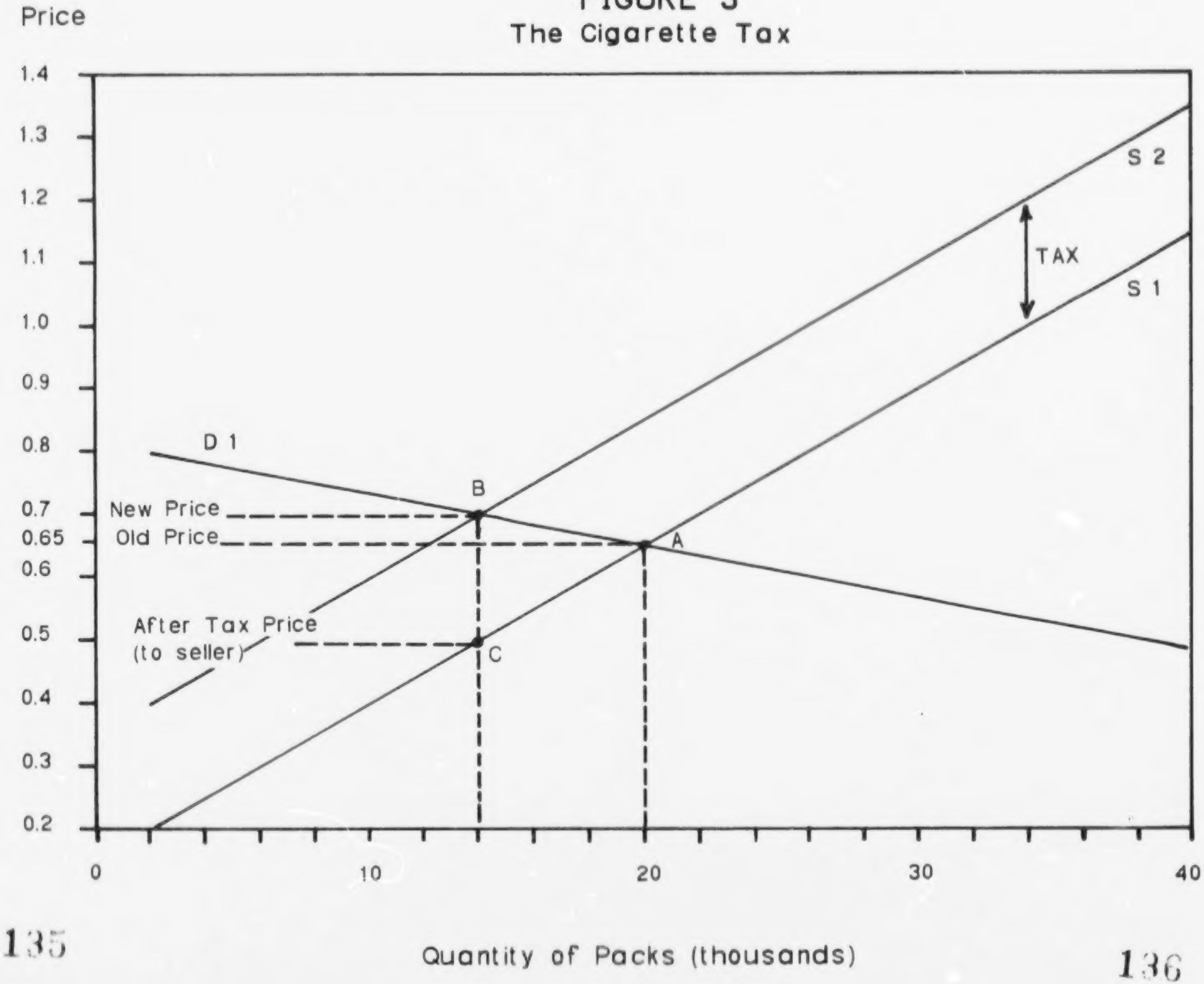


FIGURE 3
The Cigarette Tax



Name: ______________________________ Date: ______________________________

WORKSHEET 18A

WHO PAYS FOR THE STATE TAX ON GASOLINE: BUYERS OR SELLERS?

Suppose that a bill is being considered in the Nebraska Legislature to impose a $.40 excise tax on a gallon of gasoline sold at gas stations. As an economic researcher you have constructed the following demand and supply curves for gasoline. You are called to the Legislature chambers to answer the questions about who will bear the burden of this new tax.

1. Using the information provided in the graph, what is the pretax equilibrium price?

What is the pretax equilibrium quantity of gallons sold?

Identify this point on the graph and label it as Point A.

2. Now show on the graph the economic impact of a $.40 a gallon tax. Draw the new supply curve. What is the new equilibrium price?

What is the new equilibrium quantity of gallons sold?

Identify this point on the graph and label it as Point B.

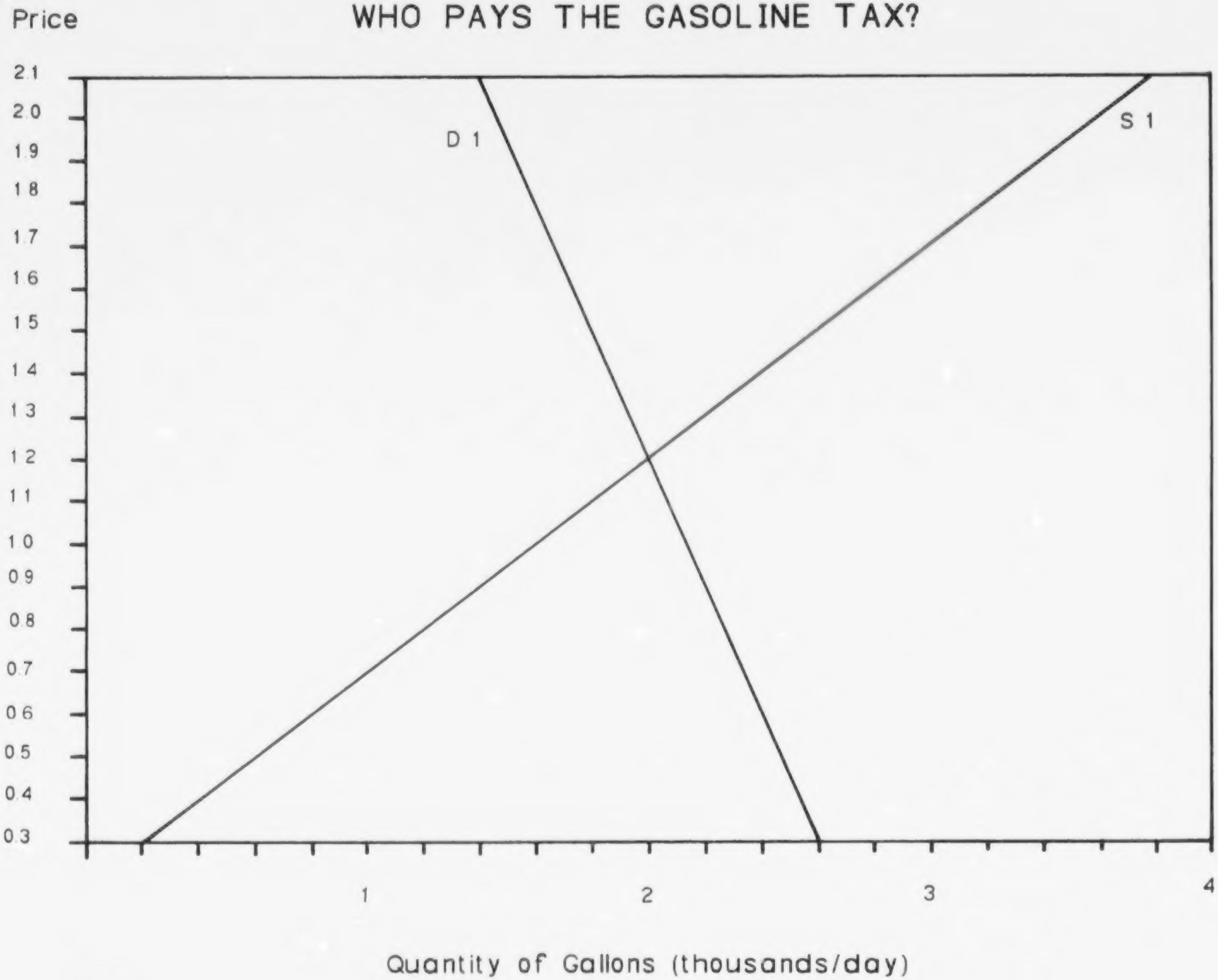
3. Estimate, using the supply and demand graphs, what amount of a $.40 tax will be borne by sellers and the amount of tax borne by buyers. Sellers wind up paying for $___________ of the tax.

Buyers will wind up paying for ___________________________ of the tax.

4. Why did one group wind up paying more of the tax than the other group? Please explain.

5. Why didn't the price of gasoline increase by the full amount of the tax--from $1.20 to $1.60?

WHO PAYS THE GASOLINE TAX?



Activity 19

PUBLIC UTILITY RATES AND REGULATION

PROGRAM GOALS:

The learner should understand that the development of energy resource and the use of these resources create impacts on environmental and economic systems.

The learner should understand that the amount of energy resources and their availability for human activity vary.

OBJECTIVES:

Students will identify examples of natural monopolies and public utilities.
Students will analyze why regulation is needed to prevent excessive use of monopoly power by utilities.
Students will describe the procedure followed generally in setting utility rates.
Students will identify key issues which may arise in a typical rate case.
Students will evaluate the merits of various positions in a simulated rate case.

KEY VOCABULARY:

Public utility, monopoly, natural monopoly, Public Service Commission, "fair" rate of return

MATERIALS:

Worksheets:	19A Public Utility Rates 19B Role-Playing Exercise

RATIONALE:

About 10 percent of the average family's disposable income is spent for electric, gas, water and telephone services. Despite the amount spent, few consumers have any understanding of how the rates for these services are set and controlled. Also, this study of the ratemaking process explains the advantages of a regulated monopoly over its free market alternatives--competition or pure monopoly.

IMPLEMENTATION:

1. Distribute Worksheet 19A Public Utility Rates. Have students read and complete the handout.

2. Distribute Worksheet 19B, Role Playing Exercise. Divide students into groups to role-play. There will be at least three groups: utility representatives; public utility commission; representatives of concerned parties (the latter could be one group or divided into groups representing consumers, business users, community agencies).

EVALUATION:

Answers to Public Utility Rates, Worksheet 19A, questions:

1. Gas, telephone, water, cable TV.

2. Same as #1.

3. They can provide service at lower cost than if there were competing firms. Commissions regulate utility rates so that the monopoly won't earn abnormally high profits.

4. Rate of return compared to similar investments' returns, utility's estimates of costs - are they legitimate?, projections of revenue - are they reasonable?, how the requested rate compares to other utilities. "Interested Parties" can be anyone who would be affected by rate hike.

5. "Fair" rate of return is what investors could earn from other investments of similar risk.

Name: ______________________ Date: ______________________

WORKSHEET 19A

PUBLIC UTILITY RATES

Directions: Below is some information that is important to your understanding of rates charged by telephone, electric, gas, and other utility companies. Read each section and answer the questions at the end of each.

1. A public utility is a business or government organization that provides a public service to individual homes and businesses. One example is your local electric company.

Name three other examples:

a.

b.

c.

2. In our capitalist economic system we believe that competition among sellers of a product is usually good because it keeps prices down. Firms who try to charge prices that are too far above costs will lose customers to their lower-priced competitors. Competition also encourages firms to be efficient by keeping their costs and therefore prices low.

The extreme opposite of competition is where there is just one firm selling a good or service. This is a monopoly. Monopolies are usually viewed as undesirable because one firm can raise its prices and earn above-normal profits. High prices also mean the firm is selling a smaller quantity than competitive firms would sell at lower prices.

However, in a few industries a monopoly may be desirable because one firm is able to provide the product or service at the lowest price--lower than several firms could. This happens when production requires a very large investment before it can begin producing even one item. In this case, where costs are kept to a minimum by having just one producer serve the whole market, we say there is a natural monopoly. Local telephone service is an example. One firm can easily hook up more customers once its lines are put into a neighborhood, but it would be wasteful and more costly to have different companies competing and running lines down the street.

Name three other examples of natural monopolies:

a.

b.

c.

3. A dilemma is raised by natural monopolies. Natural monopolies have the ability to produce the service at the minimum cost, so just one firm is better than having competition. But the monopolistic firm also will have the power to raise prices, restrict output and earn above-normal profits.

In the case of public utilites, this dilemma has led to government regulation. The firm is allowed to remain a monopoly, but the government limits the prices that the firm can charge. In a few areas public utilities are actually owned by the local government, but usually utilities are privately owned monopolies subject to regulation. The regulatory agency is called the Publilc Utilities or Public Service Commission in most states.

How are natural monopolies good for consumers?

Why do states have Public Utilities Commissions?

4. Whenever a privately-owned utility wants to raise its rates, it has to file a rate case with the Public Utilities Commission. In rare situations, the commission may initiate the case if rates are too high and provides the company above-normal profits. The procedure followed in each case generally contains the following steps:

. . .The rate case is filed by the utility.

. . The Commission studies the utility's petition.

. . Interested parties become involved in the process.

. . .Commission conducts formal rate hearings to gather evidence and opinions on the case from interested parties.

. . .The Commission issues the rate order. That is, allows the requested increase in rates, denies it, or allows a compromise.

Look at the above steps. What would the commission be looking for when it studies the utility's petition?

Who might be the "interested parties" in the process?

5. The commission needs a guide for their rate-setting policy. If the agency is biased toward consumers, it may decide in favor of lower rates than those requested. If the regulators are biased toward the utilities, they may favor higher rates. A lot depends on the type of members on the commission.

Economists believe utility rates should be set at a level that provides a "fair" rate of return to stockholders who own the company. They argue that the return should reflect the return investors could get from other investments of similar risk. For example, if prices are set too high, the rate of return will exceed the opportunity cost of capital and this could lead the company to over-invest in new plant and equipment because it will be easy to raise funds to build new plants. If prices are set too low, the rate of return is below the opportunity costs of capital and utilities might not obtain enough funds to make improvements. This could cause shortages of services such as electricity after a few years.

Therefore it is important for the commission to carefully analyze the costs and revenues of the utility filing the case. They must compare the projected rate of return to the market rate of return. The ideal is to set prices not too high and not too low!

Use your imagination to come up with possible issues in a rate case.

What is the definition of a "fair" rate of return?

Name: ______________________ Date: ______________________

WORKSHEET 19B

ROLE-PLAYING EXERCISE

Directions: Each group should be prepared to present their case according to the sequence of steps outlined in the Public Utility Rates worksheet. First the utility files its case with its reason for requesting the hike. The interested parties argue their case after some research--perhaps a visit from local utility manager or business leaders regarding local utility rates would be valuable. The commission conducts formal hearings where all sides argue their cases. Commissioners record the "evidence" supporting each side, then together make a decision. The commission should be prepared to state why they reached the decision that they did.

Utility Company: Super Electric Utilities Company is asking for a 10% rate hike to provide its shareholders with an adequate return. Their rate of return has fallen in recent years due to two facts: (a) the cost of replacing generating equipment that has worn out; (b) the number of uncollected bills has increased because the local economy has been in a slump and a number of businesses have failed and could not pay their bills, and a number of families left town without paying their bills. Thus Super Utilities has faced rising costs and declinig revenue with the current rate.

Another decision which has to be made is whether or not to raise all rates by 10% or whether to raise them unevenly based on type of service. Presently the following is true of Super Utilities costs:

	Present % paid of cost of service	Recommended % of changed revenue after rate change
Residential	45%	
Commercial	30%	
Industrial	25%	

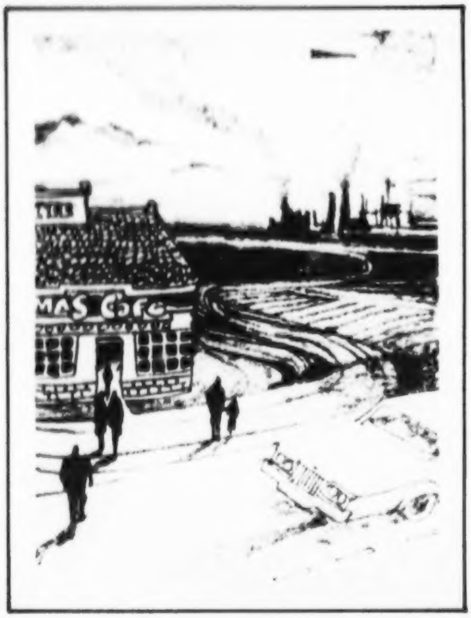
Presently their rate of return to shareholders is 11%, and economists argue that a 13% return to shareholders would be fair at the present time based on returns to other similar investments. The rate increase would raise their current revenue from $200 million to $220 million.

Public Service Commission: The regulatory commission has seven members. Three of the commissioners are former business-owners or managers; one is a former economics professor; two represent consumer organizations; one is a former utility manager.

The "interested parties": A group of consumers who feel rates are already too high and can compare their local rates to national averages. A group of businessmen who also are against a rate hike to business, but feel good electric service is important and consumers should pay a larger share since it is important to keep business rates low to attract more industry to the area. They favor a rate hike for residential customers only. The teacher may also wish to include shareholders group, industrial group.

Activity 20

ENERGY AND THE ENVIRONMENT



PROGRAM GOAL:

The learner should understand that the development of energy resources and the use of these resources create impacts on environmental and economic systems.

OBJECTIVES:

Students will define spillover cost or negative externalities.

Students will give examples of spillover costs or negative externalities in consumption and production of energy resources.

Students will discuss the advantages and disadvantages of regulations, taxes, and subsidies for reducing external costs to society from energy use.

Students will identify the trade-offs between the production or use of energy resources and environmental protection.

KEY VOCABULARY:

Spillover cost, negative externalities, regulations, taxes, subsidies,

MATERIALS:

Handout:	Energy and Spillover Costs
Worksheet:	20A Energy and the Environment

RATIONALE:

The production and consumption of energy resources can produce "spillover costs" or "negative externalities" for our society in the form of pollution or environmental damage. This externality problem is examined in this lesson and ways to reduce these external costs from energy use are explored. The trade-offs between energy use and environmental protection are also discussed in the lesson.

IMPLEMENTATION:

1. Distribute student handout--Energy and Spillover Costs. Have the students read the handout. If you think it would be helpful, read the sheet aloud as they read it silently. Then discuss any points they do not understand before they do the worksheet questions.

2. Distribute worksheet questions--Energy and the Environment. Have students answer the questions.

3. Discuss the concept of negative externality or spillover cost with students based on the reading and their suggested answers to the worksheet questions.

4. Discuss the concepts of opportunity cost and trade-offs with students as they apply to the reading.

EVALUATION:

The suggested answers to Worksheet 2A, Energy and the Environment would be:

1. There are many possible answers to this question:

a. Coal-fired electrical generating plant pollutes the air with coal soot.

b. Private nuclear plant must find a place to dispose of its nuclear waste.

c. Private hydroelectric plant is built in a scenic river basin.

d. Motorcycle purchase and use create more noise pollution.

2. Answers will depend on the negative-externality identified in the question. (Here are suggested answers to sample answers for Question 1.)

a. Coal-fired electrical generating plant pollutes the air with coal soot. The private benefits are the electricity produced. The private costs to the coal company are the costs paid for coal, labor, and the construction and operation of the power plant. The social or external costs to society are the costs from air pollution which might affect people's health, the cleanliness of the community, and long lasting environmental damage to plants and trees, etc.

b. A private nuclear plant must find a place to dispose of nuclear waste. The private benefits are the production of electrical power. The private costs are the costs borne by the nuclear power company to pay for resources (natural, labor, and capital) used to produce the energy. The possible external costs to people and the environment would be the costs of finding a safe place to dispose of the nuclear waste that does not damage the environment (e.g., land or water source) or threaten to subject people with radiation exposure.

c. Hydroelectric plant is built in scenic river basin. The private benefits and costs are similar to (a). The external or social cost would be the value to people from the scenic beauty of the river basin. There may, however, be external benefits that are not captured by the power company, if the lake produces recreational benefits.

d. Motorcycle purchase and use produces noise pollution. The priviate benefits are the satisfaction derived from riding the motorcycle. The private cost is the price paid for the motorcycle and the cost of operation. The spillover cost is loud noise that is produced by motorcycle operation.

3. Answers will vary depending on the type of solution suggested. Be sure to discuss the advantages and disadvantages of each type of solution. For example, in the case of a coal-fired electrical power plant that is polluting the air, the government might:

a. Impose regulations that require that a pollution control device be installed. This regulatory solution is the easiest to initiate and is the most widely used by govenments. It is, however, difficult and expensive to enforce because there is need for qualified inspectors and these inspectors would be open to bribery. This solution would not give the company much flexibility to decide how to solve the problem. Other equipment may be better to use or there may be new technology. The regulatory solution may not be efficient if the costs of reducing pollution by installing the equipment outweighs the benefits: (i.e. if the equipment is very expensive and the targets for pollution reduction are too high).

b. Tax the company for each pound of pollutants sent into the air. This solution would impose price on air pollution. The higher the price (the tax imposed), the less the quantity of pollutants sent into the air. You can illustrate this application of the law of demand for students with a graph. The company must decide whether to pay the tax, or reduce amount of pollution if the tax is too high. The solution uses the price system and that means it is probably more efficient than regulation. This solution does have disadvantages, however; it gives the company license to pollute if it is willing to pay the price. The solution might also be unpopular because the electricty customers and the company might fight a tax that would be imposed.

c. Subsidize the company to help it pay for the pollution control equipment or pay it to reduce pollution to a certain level. In contrast to the tax, this solution will give the company a positive incentive to reduce pollution levels. It also tends to be more efficient than the regulation because the price system, not government decree is being used to determine the optimal level of energy resource production (and pollution production). The solution is less popular politically because of the need to allocate public funds for the subsidies, but private companies and their customers would support the use of subsidies.

4. There is usually a trade-off between environmental protection and energy production and consumption. If energy activities that have negative externalities are banned, then the opportunity cost of this decision can far outweigh the benefits. An example of this is discussed in the last paragraph of the student reading. Another example that you might pose to students would be to eliminate the sale of motorcycles because they produce "unacceptable" levels of noise pollution. You might also discuss the advantages and disadvatages of banning nuclear power plants.

Discuss the difference between an all or nothing decision and a trade-off between an acceptable level of a negative externality for an acceptable level of environmental pollution.

5. As a follow-up to the lesson, you might select two or three current negative externality problems from energy production or consumption from the ones cited in the reading or suggested as answers to the student reading. Split the class into four to six groups, or two groups for each externality problem. One group can be assigned to take the pro side and one group the con side of each problem. Have students do library research to build a pro or con case. Then have a debate in class.

You might also invite a class speaker from a private energy utility and/or an environmental regulatory agency to address a current energy problem that many students would like to know more about.

HANDOUT

ENERGY AND SPILLOVER COSTS

Many economic terms, such as prices, markets, profits, and productivity, are discussed every day in the news. One economic topic that is seldom mentioned is negative externalities or "spillover costs." Yet, this concept is vital for understanding the economics of energy because our energy production and consumption often results in external costs for our society.

Negative Externalities

A negative externality, or spillover cost, occurs when all the costs of an economic decision are not paid for by the individual or the private company making an economic decision. For example, when you purchase an automobile, you pay the private cost, or dollar price for the car. You also receive the satisfaction of using the car for your private use, be it for driving to school, to work, or to parties. But there are spillover costs to other people from your private decision to buy the car. This external cost is the pollution of the living environment from the car's exhaust. In our cities, these external costs from many private decisions to buy and use cars can create a polluted atmosphere.

Energy production also creates negative externalities. In previous decades, mining companies were able to strip mine the land without being responsible for landscaping the terrain after the mining was completed. The company paid the private cost for the economic resources to mine the coal and the company received the benefits from its sales. There was, however, an external cost to society from the damage to the land that would never be repaired for use by future generations. Mining wastes and soil erosion would scar the environment.

Intervention and Solutions

Energy production and consumption can create negative externalities or spillover costs for society. In cases where the problem is severe, local, state, or federal government may intervene to reduce these negative externalities and protect the environment. This objective is accomplished in essentially three ways.

The typical way that governments restrict spillover costs is through rules and regulation. With coal strip mining, for example, governmental units may force the coal company to landscape the area that was strip mined. The external cost to society from this private economic activity is now being fully borne by the coal producer. Similarly, pollution control regulations have been imposed on automobile producers and consumers to help reduce air pollution.

Another method that governments use to reduce negative externalities is by imposing a tax on the activity that produced the externality. Taxing a product increases its price and reduces the quantity of the good produced and consumed, thereby achieving the objective of reducing the spillover cost. When taxes are imposed on specific consumption goods, they are called excise taxes. Examples of excise taxes are ones on gasoline, tires, and coal production. While the excise tax does not eliminate the consumption or production of a product, it does tend to reduce the amount of the spillover cost to society.

The opposite of a tax is a subsidy. In this case, money is given to an individual or company to get them to take a certain action. In the case of coal mining production, a subsidy could be given to coal companies to encourage them to revitalize the land after strip mining the coal to make it suitable for other uses in the future. We also give subsidies to power companies to reduce air pollution from coal-fired power plants. Subsidies give companies the incentives to reduce negative externalities.

Comparisons

Regulations, taxes, and subsides are three ways that governments handle externality problems caused by energy production and consumption. Each of these three methods has its strengths and weaknesses. Regulations are easy for governments to make and they are the most popular way that we use to reduce spillover costs. But regulations can be difficult and expensive to enforce. Enforcement may require the hiring of trained personnel who are able to check for compliance with the regulation. Bribery and corruption can also make rules and regulations less effective.

In contrast, taxes may be unpopular politically but they are a very efficient means of reducing externalities. Taxes are effective because they work through the price system. By imposing taxes on economic activities that produce negative externalities, the price of economic activity is increased, and consequently, the quantity demanded falls. Imagine what would happen to gasoline consumption if we doubled the price of gasoline through excise taxes. The quantity of gasoline used would fall, and this action would tend to reduce the number of car miles driven and reduce auto pollution in cities.

Subsidies can also be an efficient means to solve externality problems. For example, governments can try to reduce air pollution from a coal burning electrical generating plant by paying the company to reduce the level of smokestack emissions. The company could use the funds to buy new pollution control equipment. This way the company would have an economic incentive to reduce pollution without having to bear the private cost in terms of lost profits, as would be the case if taxes were used to reduce pollution. The public however, may dislike spending public funds to subsidize pollution control expenditures for priviate companies.

There will be a continual debate over how governments use regulations, taxes, and subsidies to reduce negative externalities. Politicians prefer rules and regulations because they appear to provide a simple and direct solution to the problem. Economists prefer the use of taxes and subsidies because they use the price system to provide incentives to reduce externalities and appear to be more economically efficient.

Trade-Offs and Opportunity Costs

The negative externalities or spillover costs from energy production and consumption cannot be completely eliminated. Nor should we try to eliminate them completely. Consider what our society would have to give up if we want very clean air in our major cities: car use would be severely restricted; additional pollution control equipment might be required on vehicles; power plants that emit waste would be shut down; and, factories might be closed. Clearly, the opportunity cost would be too high a price to pay relative to the benefits of clean air. What each society has to decide, therefore, is what level of the negative externality it is willing to accept to use energy resources. We must continually make trade-off decisions about our use of energy resources and our protection of the environment. It is rarely an "all or nothing" choice.

Name:______________________________ Date:______________________________

WORKSHEET 20A

ENERGY AND THE ENVIRONMENT

1. Describe at least three examples of negative externalities that have been created by energy production and consumption.

a.
b.
c.

2. In each of the examples you listed identify the private benefits from the economic activity, the private costs of the activity, and the spillover costs to society.

a. Example A

Private benefits:

Private costs:

Spillover costs:

b. Example B

Private benefits:

Private costs:

Spillover costs:

c. Example C

Private benefits:

Private costs:

Spillover costs:

3. What actions might be taken by the local, state, or federal government to reduce the negative externalities you described in Questions 1?

a. Example A

b. Example B

c. Example C

4. Should negative externalities from energy production and consumption be eliminated completely? Or, should there by a trade-off between environmental protection and energy production and consumption? State a position and discuss the advantages and disadvantages of your position.

a. Position:

b. Advantages:

C. Disadvantages:

5. What spillover problem from energy production and consumption would you like to know more about? Briefly describe your choice.

Supplementary Materials Guide

Materials listed are available at little or no cost. Teachers could establish a resource library by ordering these books and pamphlets before teaching this unit on energy and economics. Where a film or booklet is pertinent to a particular activity, it is noted in the description of the item.

Audiovisual Materials

Kingdom of Mocha - a 27-minute, animated color video that provides an entertaining introduction to basic economic concepts. Mocha is an imaginary island that undergoes rapid change as its economy develops from primitive barter to a more complex system.

Return to Mocha - a 28-minute, animated color video that illustrates several economic concepts in greater detail. The Mochans, now living in a more advanced economic society, enter into international trade agreements which allow them to interact with other economic systems.

Designed for junior and senior high school students, the programs can be used together or individually. A teacher's guide with student handouts will be provided with each film/video request. These videotapes can be obtained by writing or calling: Video Outreach, c/o The JN Company, P.O. Box 1199, Melville, New York, NY 11747, telephone: (516) 752-8800.

Balancing Needs: Coal and the Environment - Includes Teachers Guide. Designed for grades 9 through 12, this videotape is available for short-term loan. Obtained by writing or calling: The American Coal Foundation, 918 Sixteenth Street NW, Suite 404, Washington DC 20006, telephone: (202) 466-8630.

America's Changing Energy Story, with Teachers Guide - A filmstrip with audio tape, designed for grades 9 through 12 at a charge of $3.50 per copy.

Bullfrog Film and Video Catalogue, 1987-88 - A comprehensive collection of 60 energy video and film titles, available free of charge by writing or calling: Bullfrog Films, Oley, PA 19547, telephone: 1-800-543-FROG.

Energy Videos from Modern Talking Picture Service, with Teachers Guides - The world's largest distributor of free-loan films/video cassettes, offering a large selection of titles available in several different formats including captioned films for the hearing impaired. For the latest copy of free catalog, call or write: Modern Talking Picture Service, 5000 Park Street North, St. Petersburg, FL 33709, telephone: (813) 541-7571.

The Economics of Energy: Joint Council on Economic Education, 432 Park Avenue South, New York, NY 10016. Teaching kit on the economics of energy with a detailed economic analysis of recent conditions and 11 lessons. This kit may be of use to those teachers who want to extend the materials in the present curriculum unit. 103 pages.

John S. Morton, Stephen Buckles, Steven Miller, David M. Nelson, and Edward C. Prehn. Master Curriculum Guide in Economics: Teaching Strategies for High School Economic Courses. 1985. Features a sample outline of a one-semester high school economics course as well as 22 lessons designed to complement and extend textbook assignments and classroom lectures. Also contains an economics glossary, suggestions for using the lessons to give students practice in applying a decision-making process to economics issues, guidelines for selecting teaching materials, and practical advice on how to evaluate student progress. 192 pages.

Renewable Energy Overview - A listing of library resources, reading supplements, and magazines for grades 6 through 12.

Solar Energy Reading List for Young Adults - A list of library resources, reading supplements, and magazines for grades 6 through 12.

These materials can be obtained free of charge by writing or calling: Conservation and Renewable Energy Inquiry and Referral Service (CARIERS), P.O. Box 8900-ED, Silver Spring, MD 20907, telephone: (800) 523-2929.

Energy Researchers - A listing of library resources, reading supplements, and magazines with references and background materials, designed for grades 9 through adult. Obtained free of charge from the Electric Power Research Institute, c/o Innovative Communications, 207 Coggins Drive, P.O. Box 23205, Pleasant Hill, CA 94523.

Energy Source Education Program - Consisting of seven, self-contained, instructional units, this program addresses specific learning objectives, covering a wide range of energy topics and issues. Includes a curriculum project with teaching units, student booklets, and a teacher resource guide. The program is usually provided at no cost to schools by local sponsors. For more information, contact Beth Johnson or Sharian Burroughs at the Energy Source Education Program, 5505 E. Carson Street, Suite 250, Lakewood, CA 90713, telephone: (412) 374-4436 or (213) 420-6814.

Energy Education Programs: High School Programs and Resources - Designed for grades 7 through 12, the series includes a listing of library resources, reading supplements, and magazines at a charge of $1.73. Write or call: ERIC Clearinghouse for Science, Mathematics, and Enviornmental Education, The Ohio State University, 1200 Chambers Road, Columbus, OH 43212, telephone: (614) 292-6717.

Electricity: New Consumer Choices - A listing of library resources, reading supplements, and magazines with references and background materials, designed for grades 9 through adult for a charge of $4.00 per copy.

Renewable Energy at the Crossroad - A listing of library resources, reading supplements, and magazines with references and background materials, designed for grades 9 through adult for a charge of $4.00 per copy.

These materials can be obtained by writing or calling: Fund for Renewable Energy and the Environment (FREE), 1001 Connecticut Avenue NW, Suite 638, Washington DC 20036, telephone: (202) 466-6880.

Energy Systems--Your Guide to Energy alternatives for the 80's - A curriculum project with library resources, reading supplements, magazines, and background materials for grades 7 through 12. Preference given to orders more than 12; individual copies for a charge of $2.50. Write or call: Independent Power Company, P.O. Box 649, North San Juan, CA 95960, (916) 292-3040.

Summary of The Audubon Energy Plan - A curriculum framework for developers, including library resources, reading supplements, magazines, and teacher resource guide for grades 9 through adult. Obtained free of charge by writing or calling: National Audubon Society, 950 Third Avenue, New York, NY 10022, telephone (212) 546-9301.

Other Sources

National Energy Education Day Project (NEED)
P.O. Box 2518
Reston, VA 22090
(703) 860-5029

National Science Teachers Association
1742 Connecticut Avenue NW
Washington DC 20009
(202) 328-5800

ADDITIONAL SOURCES FOR ENERGY INFORMATION

National Energy Foundation, Curriculum Coordinator, 5160 Wiley Post Way, Suite 200, Salt Lake City, UT 84116.

Your local utility company (Public Power District, Electric Company, Gas Company).

Innovative Communications. 2923 N. Main Street, Walnut Creek, CA 94556.

National Science Teachers Association, 1742 Connecticut Avenue, NW, Washington DC 20009.

Amoco Educational Services, P.O. Box 5910-A, Chicago, IL 60680.

American Petroleum Institute; Public Relations Dept, 1220 L Street, N.W.; Washington, DC 20005.

League of Women Voters, 1730 "M" Street, NW; Washington, DC 20036.

Congressional Quarterly, Inc., 1414 22nd Street, NW; Washington, DC 20037.

Public Affairs Department, Exxon Corporation, 1251 Avenue of the Americas, New York, NY 10020.

Union Oil Company of California, Corporate Communications, Department A, P.O. Box 7600, Los Angeles, CA 90051.

Lincoln Electric System, 1200 "N" Street, Suite 300, Lincoln, NE 68508.

American Gas Association, Educational Programs, 1515 Wilson Boulevard, Arlington, VA 22209.

Sierra Club, Information Services, 530 Bush Street, San Francisco, CA 94108.

The NEED Project, P.O. Box 2518, Reston, VA 22090.

Edison Electric Institute, 1111 19th Street, NW; Washington, DC 20036.

Electric Power Research Institute, Inc., Communications Division, P.O. Box 10412, Palo Alto, CA 94303.

Resources for the Future, Inc., 1755 Massachussetts Avenue, NW, Washington, DC 20036.

National Geographic Society, Educational Services, Department 82, Washington, DC 20016.

Curriculum Materials

American Coal Foundation has: Coal Sample Kits, Coal World Book Reprint, Electricity from Coal, Power from Coal, Let's Learn About Coal, Land, Reclamation, and about Coal Gasification. Write or call The American Coal Foundation, 918 Sixteenth Street NW, Suite 404, Washington, DC 20006, telephone: (202) 466-8630.

Saving Energy and Money with Home Appliances - An activity booklet with reference materials and a teacher resource guide, designed for grades 9 through adult, available at a charge of $2.00 per copy.

The Most Energy-Efficient Appliances - An activity booklet with backgound materials, designed for grades 9 through adult for a charge of $2.00 per copy.

These materials can be obtained by writing or calling: The American Council for an Energy-Efficient Economy (ACEEE), Suite 535, 1001 Connecticut Avenue NW, Washington, DC 20036, telephone: (202) 429-8873.

Experiments: Properties of Gas and Heat Energy - An activity booklet designed for grades 9 through 12 free of charge.

Energy Reports - A series of reports on various aspects of energy for junior - senior high level. No charge.

These materials can be obtained by writing or calling: The American Gas Associatiion, Educational Programs Department, 1515 Wilson Boulevard, Arlington, VA 22209, telephone: (703) 841-8676.

Class Projects on Nuclear Technology (for Social Studies and Science) - An activity booklet with classroom strategies for designing and building energy equipment or models for students from grade 7 to adult. Available free of charge from the American Nuclear Society, Public Communications Department, 555 N. Kensington Avenue, La Grange Park, IL 60525, telephone: (800) 323-3044.

Energy Security White Paper: U.S. Decisions and Global Trends, and Languege of Energy: Glossary of Words. Available free of charge form the American Petroleum Institute, Educational Liaison, 1220 L Street NW, Washington, DC 20005, telephone: (202) 682-8118.

NATIONAL ENERGY FOUNDATION

5160 Wiley Post Way, Suite 200
Salt Lake City, Utah 84116
(801) 539-1406